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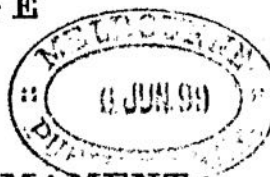
HANDBOOK

FOR THE

40-PR. R.M.L. GUN OF 35 CWT.

SIEGE

AND



MOVABLE ARMAMENT.

1897.



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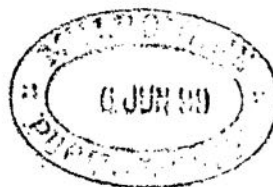
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MEMO.

This Handbook is corrected up to March, 1897. Any alterations which may be suggested, should be forwarded to the Chief Inspector Royal Arsenal, Woolwich.

40-P.R. R.M.L. GUN OF 35 CWT.

Material	..	..	..	Steel tube and W. I. jacket.
Length, total	..	..	..	120 inches.
Weight	..	..	..	35 cwt.
Preponderance	..	..	..	26 lbs.
Bore {	calibre	..	..	4.75 inches.
length	..	..	..	104.5 inches.
Rifling {	system	..	..	Woolwich
twist	..	..	..	Uniform 1 in 25
length	..	..	..	99.5 inches.
grooves {	depth	..	..	0.1 inch.
number	..	..	..	3.
width	..	..	..	0.8 inch.
Vent, of hardened copper	..	..	..	Vertical 7 inches from end of bore.



GUN.

(Plate I.)

The Mark II gun is built up of a solid ended steel "A" tube, on which is shrunk a "B" tube, a "B" coil, and a jacket; the cascable is screwed in to support the end of the "A" tube, and a gas channel is cut along the screw for the escape of gas.

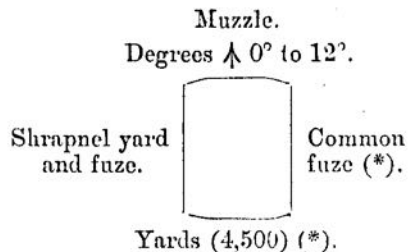
The Mark I gun is shorter by 20 inches than the Mark II, and is not strengthened with the "B" coil.

SIGHTS.

The gun is side sighted only, and the sights used are:—

1. The ordinary tangent and fore sights.
2. The crossbar sights.

Tangent Sights.—Two tangent sights are set at an angle of $1^{\circ} 20'$ to the left to correct drift; the crosshead is graduated to 30 minutes right and left for deflection, and is provided with a gun-metal sliding leaf; there is also a slow motion elevating nut under the crosshead graduated round its circumference from 1 to 10 minutes for finer adjustment in elevating. The tangent bar is four-sided and is marked thus:—



* These graduations are correct for shells fitted with gas checks.

The tangent sights are not interchangeable with those for Mark I guns.

Fore Sights, B.—There are two fore sights of the ordinary service drop sight pattern consisting of a pillar jacket, and socket, with a hog back steel blade attached to the pillar. The socket is permanently fixed to the gun and the pillar locks into it with a bayonet joint, so that when the sight is in its true position, it cannot be removed until the pillar is turned a quarter of a circle.

A clinometer is supplied for elevations above 12° .

**Crossbar Sights.*—There are two sights, the rear one fitting into the tangent sight socket and the front one into the foresight socket of the gun.

The tangent sight consists of a steel bar graduated with a yard scale up to 4,500 yards, and is fitted with a movable sight clamp. The head of the sight is rectangular and has a slot cut in it, in which a horizontal steel bar is free to slide.

The top of the horizontal bar is graduated from 0 to 8 degrees and smaller divisions.

On the left of the bar is a deflection scale by which a deflection of 1° right and 3° left can be given.

If no deflection is required, the left zero mark is made to coincide with the left face of the head.

A reversible sliding leaf, with a triangular apex for rough laying and cross wires below, is free to move along the bar. Both horizontal bar and sliding leaf are provided with clamping screws.

The fore sight has a fixed horizontal bar similar to that of the tangent sight and graduated from 0 to 8. It has also a sliding leaf with a sighting notch on the top and a clamping screw in front.

CARE AND PRESERVATION OF GUN AND FITTINGS.

The gun will be examined after firing 150 rounds with projectiles.

The exterior of the gun will be painted biennially and the bore will be lacquered at the conclusion of each year's practice, when, in addition, the vent will be plugged, and all fittings liable to damage by exposure, will be removed.

During practice the bore will be kept slightly oiled to prevent rusting; at the close of each day's practice the gun will accordingly be washed out and placed under metal, and as soon as dry, the bore will be oiled with a greasy sponge and the muzzle closed with a tampon.

The gas channels will always be kept clear, but the outer end will be stopped with a plug of greased tow when the gun is not in use.

The clinometer plane is not to be painted, and it is on no account to be cleaned by filing, or by the use of brick dust. It must be cleaned by a soft rag, and afterwards slightly oiled.

The sights must be kept clean, free from grit, and oiled, and the sliding leaves of the tangent sights must have free play; on no account are the sights to be burnished, or cleaned in such a manner as to remove the bronzing or bluing.

Preserving and fixing screws should be occasionally removed and slightly oiled, to prevent them from setting fast.

* The 40-pr. Mark I gun, is not furnished with crossbar sights.

CARRIAGE, SIEGE, R.M.L. 40 PR.

LIMBER, SIEGE, R.M.L. 40 PR.

Carriage.

(Plate II.)



The carriage is formed of two bracket sides connected by transoms, bolts, and a trail piece with steeled eye, an axletree bed with 1st class axletree, and 5-foot siege wheels with metal naves (No. 6.)

Each bracket side is constructed of plate iron, rivetted to the inner side of an angle iron frame, and is provided with firing and travelling trunnion holes.

The axletree bed is of wrought iron, constituting with the axletree a beam of box girder section; it is connected to the brackets by stays.

The elevating gear is of the worm wheel pattern; the gear is placed on the right side only, and consists of a "worm shaft" with hand wheel, held in bearings on the outside of the carriage bracket, gearing into the teeth of a worm wheel fitted with a friction clutch, giving motion to a pinion gearing into the teeth of the arc attached to the gun. The arc with its pinion is kept in position by a metal friction roller on the bracket. The wheel and screw are covered by a metal guard, made in two parts and hinged together so as to give ready access to the wheel, &c.

A stool bed of wood, strengthened by an iron plate along each side, and three coins are fitted to and issued with the carriage, for use in laying the gun, in case of any damage to the elevating gear; the stool bed also serves as "shifting plank" for the roller.

A pocket for priming irons is strapped on the rear transom, and a roller scotch is attached to the trail by chains.

The Mark I carriage differs from the Mark II principally in being of weaker construction. The Mark I gun will be mounted in this carriage.

Limber.

(Plate III.)

The limber consists of three futchels, a splinter bar of iron two stays, a platform board, a footboard, a slat, and an axletree bed of wrought iron which, with the axletree, constitutes a beam of box-girder section; it is fitted with a limber hook (steeled to prevent wear), and steel key.

The wheels are 2nd class "B" No. 25 or "C" No. 39. The washer is a "loop washer" having a shorter loop than the usual drag washer.

The shafts are one pair "near" and "off," (the latter known as the Brandling pattern, fitted with loop, for stay of outrigger), and another pair framed. There are outriggers for 4-horse draught.

The limber boxes are "near," "off," and "centre;" the "near" and "off," boxes are fitted to carry ammunition and the lids are fitted to take a proportion of small stores.

				Feet.	Inches.
Height, centre of gun	..	..	..	4	5
Length of	{ carriage	{ with wheels	..	11	8
		{ without wheels	..	10	8
	{ axletree	..	..	6	3½
		..	..	6	2
Minimum space through which carriage can turn	{ carriage and limber	{ without gun	21	2	0
		{ with gun	25	0	
Angle of trail	..	..	..	36	
Elevation, maximum	..	..	..	20°	
Depression, maximum	..	..	..	35°	
				5°	
				Feet.	Inches.
Wheels	{ track	..	..	5	2
		diameter	..	5	0
Weight of	{	carriage, empty, with wheels,	cwts. qrs. lb.		
		drag-shoe, and arc elevating	..	32	2 0
		limber, empty, with boxes,	..		
		shafts, and wheels	..	13	1 0

OVERBANK CARRIAGE.

(Plate IV.)

For siege purposes the gun is mounted on an overbank carriage constructed to fire over a 5 ft. 8 in. parapet.

The "overbank" is the service pattern carriage fitted with a top of wrought iron, a special elevating gear, arranged to depress 20° for loading, and a step for laying the gun.

The top is formed of two bracket sides connected by cross bolts and secured to the carriage at the front by a strap bolt on each side of each bracket and at the rear by clips and bolts. The elevating arrangement consists of a worm shaft and wheel, working an elevating pinion and arc by means of a friction cone. This gear is fixed at the front of the carriage between the brackets and is driven by a handwheel, the elevating arc being secured at each end to the underside of the gun.

The following is the method of removing the top :—

Depress the gun. Detach the elevating arc, turn the handwheel of the elevating gear until the teeth of the arc are clear of the pinion. The arc can then be removed from the rear and the gun dismounted. Take off the nuts and clip plates of the strap bolts and remove the rear clips and bolts, which will allow of the top being lifted off.

Weight of top (approximate)	..	..	10 cwt. 2 qrs.
Height to centre of gun at trunnions	..	..	6 ft. 3 in.
Elevation	..	..	35°.

A breech loop and a roller are supplied with these tops; they are required for shifting the gun from firing to travelling trunnion holes.

Notes on fixing a top carriage.

Top carriages and fittings are not interchangeable, and will only fit the travelling siege carriage the No. of which is marked on them.

The following tools are required :—

Knock-up wrench, large	..	..	..	1
McMahon's spanner	..	..	..	1
Spanner for check nuts..	..	..	..	1
Small half-round file for removing burrs	..	..	..	1

The following articles should first be removed from the lower carriage:—

Side-arms and straps.
 Cap-squares.
 Coins.
 Worm wheel, shaft, and hand wheel.
 Stool bed.
 Side-arm straps.
 Elevating gear.
 Drag-shoe hook.
 Temporary bolts removed from front of brackets.
 Loop lashing screws.
 Staple plate for roller.

The fittings for the top carriage elevating gear are now carefully adjusted between the front part of the brackets of the lower carriage, care being taken that the holes in the fittings correspond with those in the carriage, or difficulty will be experienced in inserting the screw bolts.

The fittings are then nutted up to the carriage, the drag-shoe hook is replaced, and the worm-screw shaft fixed in its bearings, front and rear.

The carriage step is put on and secured by a $\frac{1}{2}$ -inch split key.

The top carriage *may*, in case of necessity, be mounted up the trail by "man-handling" it; but it is awkward work, and to be avoided, if possible, by using a gyn to raise the top carriage, which may be slung by means of a heavy drag-rope put on close in rear of the trunnion holes. When high enough the lower carriage is run under it, the four vertical tensile bolts are allowed to hang down, and guided into position as the top carriage is lowered, the plate with staple and straps for side-arms is put on the left front tension bolt just before the top carriage is lowered.

The four vertical tension bolts are secured to the lower carriage by two plates, through which their lower ends pass, a washer having first been put on each, the bolts are nutted up.

The cross-stay nuts are now tightened up *as much as possible on both sides*, by using the powerful "knock-up" wrench.

The after part of the top carriage is secured to the trail by screw nuts and clip plates, which latter are marked.

To adjust the elevating arc the gun should be depressed about 5°, when the ends of the arc (which are marked "muzzle" and "breech") are placed in the patches, the arc being worked into position by means of the worm-wheel. The arcs are kept in position by large pins, which are secured with washer and pin.

INSTRUCTIONS FOR CARE AND PRESERVATION.

Care should be taken that all nuts, screws, and bolts are properly tightened; on no account should a hammer be employed in doing this.

All bright parts should be kept clean but not polished, and when not in use slightly greased.

A nut, screw, or bolt, if removed, should be slightly oiled before being replaced; and to prevent damage by the threads crossing, a few turns should be given by hand before employing the spanner.

The elevating gear must be kept clear of clotted oil, dirt, and corrosion, and well lubricated. When not in use the removable parts should be greased and placed in store.

The axletrees and grease-chambers of the wheels should be frequently cleaned, and all dirt and grit removed before lubricating. To ensure thorough lubrication the chambers must be kept filled with grease.

Ammunition boxes should be occasionally removed and examined underneath. Care must be taken to prevent the lodgment of water on any part of the mountings.

When carriages are parked, or placed in sheds with the shafts exposed, the latter should be raised on the props to keep the points dry.

Defects or damage must be made good without delay; if the paint becomes rubbed off at any part it should be patched over as soon as possible.

PLATFORM SIEGE CLERK'S MARK II.

(Plate V.)

This platform consists of two inclined planes of fir (having a slope of 3°), 4 transoms, and 1 oak trail plank plated with iron, two front stops and two rear stops.

The inclined planes are each fitted on their inner sides with a riband plated with iron along its inner edge; a movable iron stop in front and rear to keep the wheels from running off; a plate round the thin end with a hole for the pivot pin; at the rear a traversing bolt. Three of the transoms are 7 feet long and the fourth 10 feet.

The first transom has four holes for the pivot pins of which the two inner are used when the platform is laid for use with the 40-pr.

Weight of platform, $17\frac{1}{2}$ cwt.

To lay the Platform.

In addition to the platform itself two service oak planks $6' \times 12'' \times 3''$, one piece of oak skidding $3' \times 5'' \times 4''$, and two field pickets $2' 6''$ are required.

Entrenching Tools, &c., required:—4 picks, 4 shovels, 2 rammers, 6 pickets, 1 maul, 1 field level, 1 measuring tape or rod.

The line of fire (*lf*) having been ascertained, and marked by pickets or banderols, the front transom (*b*), with the holes in it, is laid at right angles to it, in the centre of the gun portion 6 inches from foot of the interior slope of the parapet; this is done by making the distances *ef*, *e'f*, from ends of the transom to any point *f* in the line of fire equal. The transom should be flush with the ground, and laid horizontal by aid of a field level.

A second front transom (*b'*) is laid in rear of and close to the first. At a clear interval of 3 ft. 8 in. is laid the third transom.

The rear transom is laid at such distance from the front, that the ends of the inclined planes will rest on them so as to allow a bearing for the handspikes under the traversing bolts.

The rear of the trail plank is supported on a plank placed 15 inches in front of the rear transom, the trail plank being lengthened

by a 6-foot oak plank butted against a piece of skidding supported by two pickets. Two small scotches (s s), should be screwed down to the centre transom for the front of the trail plank to butt against.

To place the Gun on the Platform.

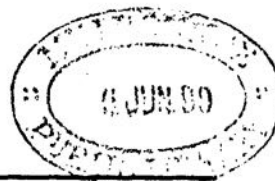
This may be done by removing the rear stops and moving the gun up from the rear on inclines of coins or skidding with planks on them.

It may also be done by placing the gun in position before the inclined planes have been placed and pivoted; the wheels are then raised in succession, and the inclined planes run under them and pivoted to the front transom.

AMMUNITION.

PROJECTILES.

(Plate VI.)



Nature	Mark	Bursting charge		Weight
		Weight	Powder	
		lbs. oz.		lbs. oz.
Shell { Common ..	II	3 0	P. and F.G.	40 0
	III	3 6		40 0
	II and III	0 4½	F.G.	43 0
Shot case ..	II	—	—	38 6

Common Shell.

The common shell is of cast-iron, with a truncated point fitted with a bush to suit the G. S. fuze; two rings of studs are pressed into undercut holes in the body.

The Mark II differs from the Mark I, in being cast to the finished dimensions, and in being fitted with a gas check.

Mark I shells altered to take the gas check are distinguished by a * added to the numeral.

The Mark III is the same as the Mark II, but the bush for the fuze is made with a flange.

The gas check is made of copper, with three projections on the rim made to the same twist as the studs on the shell, and six fire holes to allow the flames to pass through to ignite the wood time fuze.

Shrapnel Shell.

This shell consists of an iron body cast to the finished dimensions, and fitted with a steel head over a wood block; near the base the walls are thickened so as to form a shoulder to support a diaphragm, beneath which is the powder chamber. The bursting charge is contained in a cup, the neck of which fits on to a metal pipe; the opposite end of this pipe is inserted in a composite socket. The shell contains 180 mixed metal balls, 18 per lb. Mark I is obsolete; Mark III differs from II in being fitted for a gas check, and Mark II so fitted have a * added to the numeral.

Case Shot.

The body of this shot is a tin cylinder, with the base strengthened by a ring of sheet-iron riveted on the outside, and a disc laid loose inside; the interior is lined with three segments of sheet iron. The top is a disc of sheet iron fitted with an iron handle. The case holds 405 mixed metal balls 16 per lb., packed in clay and sand. Mark II is the same as Mark I, but the handles are more strongly attached.

INSTRUCTIONS FOR FILLING SHELL.

All shells before being filled should have the fuze-holes and interior thoroughly examined to ascertain that they are dry and clean.

Common.

Remove the plug from the fuze hole, place the filling-rod in the bag, insert it through the fuze-hole, taking care not to force the end of the rod through the bottom of the bag; carefully push in the bag until the neck only is in the fuze-hole, a portion being kept outside, as the whole bag must not be allowed to slip into the shell during the operation of filling; then withdraw the rod.

Weigh out the bursting charge in the proportion of 2lbs. P. to 5 ozs. of F.G.; drop one portion of P. powder into the shell pebble by pebble, then insert the funnel and pour in the proportion of F.G. Lightly stir and press the mixture until the shell is quite full, tie the neck of the bag with twine close to the top of the fuze-hole. A piece of twine is attached to the neck of the bag for this purpose, it must be shifted to its proper position if necessary. Cut off the superfluous choke and push the neck of the bag well down, and to one side of the fuze-hole; insert in every shell two "Bags, primer filled, 7 drs.," or more if there is room, then screw in the fuze or plug as required, taking care that the fuze-hole is clean and the fuze or plug lubricated.

Shells primarily intended for practice will be filled with shell L.G. powder.

Shrapnel.

Remove the plug from the fuze-hole, and after seeing that the fuze-hole is clear of any dirt, &c., insert the leather funnel and pour in the bursting charge, which has been previously weighed out or measured. This must be done gradually, for if the whole of the powder is put in at once the tube will probably become choked. The shell should be tapped on the side with a wooden mallet, until the whole of the bursting-charge has passed down the tube, taking care that none of the powder is left at the bottom of the socket. Drop in the "primer Shrapnel shell," and, by means of the large Shrapnel screw-driver, screw it firmly into the tube, and then screw in the plug.

FIXING PLUGS AND FUZES AND SECURING SHELLS.

When plugs or metal fuzes are screwed into shells, they will be lubricated with a mixture composed as follows:—

Luting, Mark II	100 parts by weight.
Luting oil	17 " "

The mixture is to be applied to the threads with a brush, in sufficient quantity to cover them, care being taken that it does not extend over the bottom. A coat of paint of the same colour as the tip of the shell is to be applied over the junction of the G.S. fuze-hole plug and shell, when the latter is filled.

Empty projectiles fitted with plugs and kept in exposed situations where the plugs are liable to become set fast by corrosion from the action of salt water, or otherwise, should have their plugs unscrewed once at least every six months, and the threads cleaned and relubricated as above.

Instances have occurred in which fuze-hole plugs or common shells have been so jammed in as to be immovable, in consequence of using the "Wrench, base plug." The "Key, fuze and plug, G.S.," the "Key, plug, G.S.," and "Key, fuze, universal," are the only implements which should be used for screwing in the G.S. plug.

DISTINGUISHING MARKS.

Projectiles will be painted and marked as follows:—

Common shell	..	..	..	Black all over.
Shrapnel..	..	..	..	Black with red tip.
Case shot..	..	..	..	Black all over.

Filled shell will, in addition, be marked with a red band below the tip.

The following additional markings will be shown:—

- (a) The word "fuzed," if the shell is fuzed.
- (b) The word "Bag" if one has been used.
- (c) The monogram of the Station except when filled by R.A.
- (d) The date of filling.
- (e) A disc 1 inch in diameter if shalloon primers have been inserted.
- (f) The letter P 1 inch long, if filled with P. and F.G.

Projectiles which are to be used for practice only will be marked with a yellow band $\frac{1}{2}$ inch wide round the body.

Shells which have been emptied will be marked on the head with the letter "E" in red paint, and also the monogram of the station.

For further instructions see Magazine Regulations.

EXAMINATION OF FILLED SHELLS.

The examination of filled shells will only be carried out by an Inspecting Ordnance Officer. (For details, see Magazine Regulations.)

FUZES.

Plates VII to XI.

Percussion	{ R.L. No. 7, Marks II*, III* and IV. Direct action, No. 3, Marks I, II and III.
Time	{ 15 secs, with detonator, No. 43, Mark III. Sensitive, middle, No. 24, Mark I. Percussion, middle, No. 54, Mark II.

Percussion R.L. No. 7, Mark III and IV.*

(Plate VII.)

This fuze consists of a body, needle, guard, pellet with cap, base plug, and safety pin.

The body is of gun-metal, it is tapped on the exterior to the G.S. pitch and taper, and on the interior at the bottom to receive a screw-plug also of gun-metal. On the top is a square keyhole recess of proper size to take the "Key, plug, G.S." or "Key, fuze, Universal."

From the lower surface of the head projects a steel needle.

Inside the body is a gun-metal guard recessed as shown in the plate, and supported in position by two feathers on the exterior circumference of pellet.

The pellet is made of lead and tin in equal proportions, and has a bevelled edge above the feathers corresponding to a similar recess in the interior surface of the guard.

The pellet is hollow and is cupped out to receive a copper cap containing about $3\frac{1}{2}$ grains of cap composition, pressed and varnished in the same way as ordinary percussion caps. The upper part of the pellet is covered by a copper cap, attached by three indentations, to protect it from being damaged by the safety pin when jolted in the limbers, thereby allowing the detonating composition to approach dangerously near to the point of the needle.

The safety of the fuze in transit, &c., is ensured by a safety pin made of twisted brass wire, which has a tarred twine becket wherewith to pull it out at the moment of loading.

When the safety pin is withdrawn, the hole through which it passed, is closed by a small lead pellet which sets back across it.

The bottom plug screws in the bottom of fuze. It has a fire-hole drilled through its centre which is closed by a thin brass disc secured by spinning over.

These fuzes require no preparation except the removal of the safety pin; they are screwed firmly into the fuze-hole by means of the "Key, plug, G.S."

The safety pin is not to be withdrawn until after entering the shell into the muzzle.

On discharge, the guard sets back, shearing the feathers; the pellet is then free to move forward on to the needle on impact.

Mark IV differs from Mark III in having a feather on the guard fitting into a slot in the side of the fuze, so as to prevent the pellet and guard working forward against the needle during flight. Fuzes so altered will be designated Mark III*.

Percussion, Direct-Action, No. 3, Marks II and III.

(Plate VIII.)

This fuze is intended to act on direct impact; it cannot be depended on to act on graze unless fired at angles of elevation of 10° and upwards.

It is made of gun-metal, turned all over and screwed below the head to fit G.S. fuze-hole. The interior is bored out at the lower end for the powder charge, and closed with a screw base plug. A recess in the upper part of the fuze is charged with detonating composition and the holes communicating with the magazine are filled with powder priming. The fuze is fitted with a steel needle, passing through, and secured in, a copper suspending disc 0.032 inch thick. The lower part of the fuze is filled with pistol powder. A gun-metal cap having a T-shaped slot cut out in each side to fit over the projecting pins in the head of the fuze, is secured over the top.

It requires no preparation except the removal of the plug; the

fuze is screwed firmly into the fuze hole by the "Key, fuze, universal." The plug is not to be removed until just before entering the shell into the breech of the gun.

On striking any object, the suspending disc is driven in and the needle is forced against the detonating composition, thereby exploding the fuze.

Mark I* is the obsolete Mark I altered and is practically identical with Mark II. It was altered by fitting a stronger needle disc and a shorter needle.

Mark III differs from Mark II in being screwed its whole length to the G.S. gauge, and in having two slots in the head for the "key, fuze, universal." It is also fitted with a safety plug which screws into the head over the needle disc. This plug is screwed left handed, and is marked with an arrow and "unscrew," to show the direction it has to be turned for withdrawing it; a slot across the centre suits the flat end of the "key, fuze, universal."

Marks I and II are to be used on land fronts, Mark III on sea fronts.

Time 15 secs. M.L. with Detonator, No. 43, Mark III.

(Plate IX.)

This fuze is made of beech. It is bored with a central composition hole and six powder channels. The powder channels communicate one with another by means of a strand of quickmatch pressed into a groove on the base. The fuze composition is pressed into the central hole. The fuze is ignited on discharge by setting back of the hammer on to a detonating pellet. The hammer is retained by a suspending wire 0.03 inch thick, and by a safety pin which is withdrawn before ramming home. The fuze is marked spirally from 1 to 30, the figures and dots being arranged in six columns corresponding to the powder channels.

When reference is made to the divisions of the fuze in teaching it is far simpler to call them merely divisions, without any reference to either tenths of an inch of length or seconds of burning. Both are only nominal, and simply confuse the learner. To say that for a certain number of yards of range, a certain number of divisions of the fuze are required, is all that can be necessary.

These fuzes are prepared for any desired time of flight by boring through the side hole corresponding to the required time, into the composition.

When using the hook-borer place the fuze in the hook of the hook-borer in the proper position for boring the required hole; enter the bit into the side hole, screwing up until the bit has entered as far as the borer will allow, taking care to press the fuze with the fingers so as to ensure its bedding fairly in the hook.

Unscrew, and when the bit is quite clear, remove the fuze from the hook. The length of the bit is so regulated that, when placed in the handle, it will enter sufficiently far into the composition when screwed down to the shoulder. If the bit should become unserviceable, the handle must be detached from the shank and the tightening-screw unscrewed, the square hole in the hook being made for that purpose. Care must be taken when substituting another bit that it is properly placed in the handle, and that the tightening screw firmly presses upon it, for if any space be left between the handle and the head of the bit, the end will not enter a sufficient depth, into the composition. The borer should be occasionally examined and cleaned.

The operation of preparing the fuze and fixing it in the shell takes on an average about 15 seconds; with a little practice these operations may be performed in a shorter time.

These fuzes should be screwed into the fuze-hole by hand; when they cannot be screwed any further they are properly secured. These fuzes must not be fixed by striking them with a mallet or any other instrument, neither must they be struck against anything.

The safety pin will not be withdrawn until after entering the shell into the muzzle.

Time; Sensitive, Middle, No. 24, Mark I.

(Plate X.)

The fuze consists of the following parts:—

Body, with stem, lighting pellet, two retaining pellets, two spiral springs, needle, composition ring, dome, cap, two safety pins, base plug, and axial magazine filled with M.G.¹ powder.

All the parts are made of gunmetal.

The composition ring is graduated on its periphery from 0 to 30, and reads to quarter units. An Ψ is stamped on the ring to show the safety point, and when this coincides with the Λ on the body the fuze is set at safety. The cap which screws on to the top of the stem, is made hexagonal, to fit the "Key, fuze, universal."

The fuze is set by loosing the screw cap on the top of the stem, by means of the "Key, fuze, universal," and turning the dome and ring till the require graduation on the latter coincides with the arrow head on the body; then tighten the screw cap. The safety pins are withdrawn at the moment of loading. On discharge the centrifugal action causes the retaining pellets to fly out, releasing the lighting pellet, which flies by centrifugal force against the needle, firing the detonator, which ignites the powder in the pellet and axial magazine, this latter lighting the quick match in the composition ring.

Time and Percussion, Middle, No. 54, Mark II.

(Plate XI.)

The body is hollow, and has a stem on its upper side. Round the base of the stem an annular groove is cut, from which a hole is bored to the side of the body for the gas to escape through. The sides of the body are pierced with three fire holes; the top of the body is screwed to receive a hexagonal cap. The cap fits the hexagonal hole in the centre of the "key, fuze, universal." Between the cap and the dome fits a brass washer with feathers fitting into slots on the stem of the body; it is to prevent the dome from turning with the nut and altering the setting of the fuze when the cap is screwed tight.

The composition ring has an annular groove round it for the composition; a projection on the upper side contains the hammer with steel needle suspended by a .022-inch wire, and a detonator under it for lighting the composition in the ring. The hammer is also secured by a safety pin passing under it, the hole in the ring left by its withdrawal being closed by a brass pellet with a spiral spring above it.

The composition ring is barrel-shaped outside to facilitate the setting of the fuze. The ring is kept in position by three pro-

jections on the side, which fit closely round the stem of the body. An escape hole is bored through the top of the ring at the commencement of the composition, and three radial ones are bored through the inner sides at equal distances round it.

The top and first radial holes are covered with paper, the two other radial holes with asbestos. The ring is graduated from 0 to 30, and reads to quarter units, and has an arrow head between the last graduation and the commencement to show the position of safety.

To set the time arrangement of the fuze, the nut is loosened with "key fuze, universal," and the ring moved round till the required graduation is opposite the arrow on the body; the nut is then tightened, great care being taken to see that it is screwed down as tightly as possible.

The time of burning of the fuze at rest, when set at 30 or full length, is 16 seconds.

The action of the time arrangement is that, on discharge, the hammer sets back, shearing the suspending wire, and fires the detonator, which lights the end of the ring of composition: this burns until the channel communicating with the lower part of the fuze is reached, when the flash passes down it and fires the detonator and magazine in the percussion arrangement.

CHARGES.

6½ lb. R.L.G.

The cartridges are made of No. 1 class silk cloth, hooped with 0.35 silk braid and choked with silk twist.

Directions for Making Up Cartridges.

Care will be taken to see that the empty cartridges are thoroughly dried before being filled, and the proper charge will be carefully weighed out, and inserted in the cartridge by means of the "funnel, copper, cartridge."

The cartridges are choked as follows:—The mouth is drawn together into several plaits with a magazine needle threaded with two strands of silk twist; after drawing together the mouth of the cartridge, three turns will be taken round the plaits, and the choke thus formed will be further secured by passing the needle three times through it alternately above and below the turns, thereby stitching down the turns round the choke at two points equi-distant from each other.

The cartridges will be made up to their proper lengths and diameters by means of the hoops. The operation is performed as follows:—Draw the braid through the silk cloth until the knot of the loop comes home to the cartridge; the single end being passed through the loop from underneath, pass it to one side of and under the loop, then draw the hoop tight, and keep it so by placing the forefinger of the left hand firmly on the loop; bring the running end between itself and the loop, and draw tight the single bend thus formed, taking care that the bend bites on the loop and not on the single end, otherwise the knot will slip. The maintenance of the proper form of the cartridge depends on the hooping being thus secured.

Marking Filled Cartridges.

Cartridges will be marked with the nature of the powder they contain. A record of the powder used in all cartridges, with maker's name, lot, and date of filling, will be marked on the package, and will be kept in a book for reference.

All cartridges issued from store filled will have the initial or monogram of the station at which they are filled stamped on the bottom end. The cartridges filled by the Royal Artillery will be distinguished by having no initial letter or monogram stamped on them. This order does not apply to cartridges filled by working parties of the Royal Artillery for the Ordnance Store Department.

TUBES, FRICTION, COPPER, SOLID DRAWN, WITH
BALL, MARK II.

The tube is made of solid drawn copper, and has a solid head; it is filled with pistol powder, and the bottom is closed by a brass ball over which is a cork plug, secured by shellac. The length is 2.1 inches. A hole is bored through one side of the tube, having its centre about .25 inch below the top, and through this hole projects a copper nib-piece, with a small hole bored in it to allow the flash to reach the powder in the tube. This nib-piece contains a roughened copper friction bar, which is smeared with a detonating composition of chlorate of potash, sulphur, and sulphide of antimony, and the nib-piece is pinched down upon the friction bar, the projecting part of which has a vertical eye, into which the hook of the lanyard fits. On pulling the lanyard the friction bar is drawn out, igniting the composition and firing tube. The gas from the exploded cartridge drives the tube out of the vent.

RANGE TABLE FOR 40-PR. R.M.L. Gun

* Charge, 6 $\frac{3}{4}$ lb. R.L.G. Powder.

Projectile, Common Shell, fitted with gas check.



Range.	Elevation.	Angle of Descent.	Remaining Velocity.	5 minutes will alter elevation point of impact or decreases the range by		50 per cent. of rounds should fall within*			Time of Flight.	Dangerous zone for a height of 6 feet.	Fuse scale, 15 sec. Time Fuse with Detonator.	
				yards.	yards.	Length.	Breadth.	Height.			Range.	Length of Fuse.
yards.	° /	° /	f.s.	yards.	yards.	yards.	yards.	yards.	seconds	yards.	yards.	
0	—	—	1,425	—	—	—	—	—	—	—	120	0.5
100	—	—	1,392	—	—	1.5	0.08	—	0.20	—	220	1.0
200	0 6	0 18	1,359	56	0.29	3.0	0.16	0.02	0.40	—	320	1.5
300	0 15	0 27	1,326	53	0.43	4.3	0.24	0.03	0.65	whole	420	2.0
400	0 24	0 39	1,294	51	0.58	5.6	0.32	0.06	0.90	174	520	2.5
500	0 34	0 48	1,262	50	0.72	6.8	0.40	0.10	1.15	142	620	3.0
600	0 44	1 0	1,235	49	0.87	8.0	0.48	0.14	1.40	115	720	3.5
700	0 54	1 12	1,208	48	1.01	9.1	0.56	0.19	1.65	95.2	820	4.0
800	1 4	1 24	1,182	47	1.16	10.2	0.63	0.25	1.90	81.9	920	4.5
900	1 14	1 33	1,156	46	1.31	11.3	0.71	0.32	2.15	70.1	1,020	5.0
1,000	1 25	1 50	1,130	45	1.45	12.4	0.79	0.40	2.40	62.5	1,120	5.5
1,100	1 36	2 4	1,110	44	1.60	13.4	0.87	0.48	2.65	55.0	1,220	6.0
1,200	1 47	2 19	1,091	43	1.74	14.4	0.94	0.58	2.90	49.0	1,315	6.5
1,300	1 58	2 34	1,072	42	1.89	15.6	1.02	0.63	3.15	44.2	1,410	7.0
1,400	2 9	2 50	1,053	41	2.03	16.3	1.10	0.81	3.40	40.2	1,505	7.5
1,500	2 20	3 6	1,034	40	2.18	17.2	1.17	0.93	3.70	36.8	1,600	8.0
1,600	2 32	3 20	1,021	40	2.32	18.1	1.24	1.06	4.00	34.1	1,695	8.5
1,700	2 44	3 35	1,008	39	2.47	19.0	1.32	1.20	4.30	31.5	1,790	9.0
1,800	2 56	3 55	995	38	2.61	19.9	1.33	1.37	4.60	29.1	1,885	9.5
1,900	3 9	4 15	982	37	2.76	20.7	1.46	1.54	4.90	26.8	1,980	10.0
2,000	3 22	4 36	970	36	2.91	21.5	1.53	1.72	5.20	24.8	2,075	10.5
2,100	3 35	4 50	958	36	3.05	22.3	1.60	1.90	5.50	23.1	2,170	11.0
2,200	3 49	5 12	947	35	3.20	23.1	1.63	2.11	5.80	21.5	2,265	11.5
2,300	4 3	5 38	936	34	3.34	23.9	1.76	2.31	6.10	20.1	2,360	12.0
2,400	4 17	6 1	925	33	3.49	24.7	1.84	2.60	6.40	18.8	2,455	12.5
2,500	4 32	6 27	914	32	3.62	25.5	1.91	2.89	6.70	17.5	2,550	13.0
2,600	4 47	6 54	904	31	3.78	26.2	1.99	3.20	7.00	16.3	2,645	13.5
2,700	5 3	7 25	894	30	3.92	26.9	2.06	3.52	7.30	15.2	2,740	14.0
2,800	5 19	7 56	884	29	4.07	27.6	2.13	3.84	7.60	14.2	2,835	14.5
2,900	5 35	8 12	874	29	4.21	28.3	2.21	4.17	7.95	13.1	2,930	15.0
3,000	5 52	8 46	864	28	4.36	29.0	2.28	4.50	8.30	12.8	3,025	15.5
3,100	6 9	9 10	855	28	4.51	29.7	2.36	4.85	8.65	12.2	3,120	16.0
3,200	6 27	9 48	846	27	4.65	30.4	2.44	5.21	9.00	11.7	3,215	16.5
3,300	6 45	10 5	837	27	4.80	31.0	2.51	5.60	9.35	11.2	3,310	17.0
3,400	7 3	10 42	828	26	4.94	31.6	2.59	6.00	9.70	10.7	3,405	17.5
3,500	7 22	11 0	819	26	5.09	32.2	2.66	6.40	10.05	10.2	3,500	18.0
3,600	7 41	11 20	810	26	5.23	32.8	2.74	6.80	10.40	9.8	3,595	18.5
3,700	8 0	12 5	802	25	5.38	33.4	2.82	7.23	10.75	9.4	3,690	19.0
3,800	8 20	12 25	794	25	5.52	34.0	2.90	7.67	11.10	9.0	3,785	19.5
3,900	8 40	13 15	786	24	5.67	34.6	2.97	8.11	11.50	8.6	3,880	20.0
4,000	9 0	13 40	778	24	5.81	35.2	3.05	8.55	11.90	8.2	3,975	20.5
4,100	9 21	14 30	770	23	5.96	35.8	3.13	9.00	12.30	7.8	4,070	21.0
4,200	9 42	14 50	762	23	6.11	36.4	3.21	9.45	12.70	7.5	4,165	21.5
4,300	10 3	15 5	754	23	6.25	37.0	3.28	9.90	13.10	7.4	4,260	22.0
4,400	10 24	15 28	746	23	6.40	37.5	3.36	10.35	13.50	7.2	4,355	22.5
4,500	10 46	15 43	739	23	6.54	38.0	3.44	10.80	13.95	7.1	4,450	23.0
—	—	—	—	—	—	—	—	—	—	—	4,545	23.5
—	—	—	—	—	—	—	—	—	—	—	4,640	24.0
—	—	—	—	—	—	—	—	—	—	—	4,735	24.5
—	—	—	—	—	—	—	—	—	—	—	4,830	25.0
—	—	—	—	—	—	—	—	—	—	—	4,925	25.5
—	—	—	—	—	—	—	—	—	—	—	5,020	26.0
—	—	—	—	—	—	—	—	—	—	—	5,115	26.5
—	—	—	—	—	—	—	—	—	—	—	5,210	27.0
—	—	—	—	—	—	—	—	—	—	—	5,305	27.5
—	—	—	—	—	—	—	—	—	—	—	5,400	28.0
—	—	—	—	—	—	—	—	—	—	—	5,495	28.5
—	—	—	—	—	—	—	—	—	—	—	5,590	29.0
—	—	—	—	—	—	—	—	—	—	—	5,685	29.5
—	—	—	—	—	—	—	—	—	—	—	5,780	30.0

* This Range Table is applicable to the 7 lb. R.L.G.² charge which gives the same muzzle velocity.

(5859)

B

RANGE TABLE FOR 40-pr. R.M.L. GUN, MARK I.

Based on Practice of 3rd November, 1892.

Minute 33,454.

Charge { weight— $6\frac{3}{4}$ lb.
nature of powder—R.L.G. 4.

Projectile { nature—Shrapnel shell, filled and plugged.
weight—42 lb.

Muzzle velocity—1313 f.s.

Jump—5 minutes.

Nature of mounting for which jump is calculated—Travelling, siege, Mark I.

Range.	Elevation.	Angle of descent.	Slope of descent.	5 minutes' elevation will alter range by	Remaining velocity	Fuze scale for 15 seconds time fuze with detonator.	Time of flight.
yards	° /	° /	1 in.	yards.	f.s.		seconds.
100	0 06	0 08	430	43	1,285	1.0	0.27
200	0 17	0 19	181	45	1,257	1.5	0.54
300	0 28	0 30	114	44	1,230	2.0	0.80
400	0 39	0 42	82	41	1,204	2.5	1.05
500	0 50	0 51	64	43	1,179	3.0	1.32
600	1 01	1 06	52	42	1,155	3.5	1.58
700	1 12	1 19	43	41	1,132	4.0	1.84
800	1 24	1 32	37	41	1,110	4.5	2.11
900	1 36	1 45	33	40	1,091	5.0	2.37
1,000	1 48	1 59	29	40	1,072	5.5	2.64
1,100	2 00	2 13	26	39	1,056	6.0	2.90
1,200	2 13	2 28	23	33	1,041	6.5	3.18
1,300	2 26	2 44	21	38	1,027	7.0	3.46
1,400	2 39	3 01	19	37	1,014	7.5	3.75
1,500	2 52	3 18	17	36	1,001	8.0	4.03
1,600	3 05	3 36	16	36	990	8.5	4.32
1,700	3 18	3 54	15	35	979	9.0	4.62
1,800	3 32	4 13	14	35	969	9.5	4.92
1,900	3 46	4 33	13	34	957	10.0	5.22
2,000	4 00	4 54	12	33	947	10.5	5.52
2,100	4 15	5 15	11	33	937	11.0	5.81
2,200	4 30	5 38	10	32	927	11.5	6.13
2,300	4 46	6 02	9.4	31	918	12.0	6.44
2,400	5 02	6 27	8.8	31	909	12.5	6.75
2,500	5 18	6 53	8.2	30	900	13.0	7.07
2,600	5 34	7 20	7.7	30	891	14.0	7.39
2,700	5 51	7 47	7.3	29	882	15.0	7.72
2,800	6 09	8 15	6.9	29	873	15.5	8.05
2,900	6 27	8 45	6.4	28	864	16.0	8.39
3,000	6 45	9 15	6.1	27	855	17.0	8.73
3,100	7 03	9 46	5.8	27	846	17.5	9.07
3,200	7 22	10 18	5.5	26	837	18.0	9.42
3,300	7 42	10 51	5.2	26	828	19.0	9.79
3,400	8 02	11 24	4.9	25	820	19.5	10.17
3,500	8 22	11 58	4.7	25	812	20.5	10.56
3,600	8 43	12 33	4.5	24	804	21.5	10.95
3,700	9 05	13 09	4.3	24	796	22.0	11.35
3,800	9 27	13 45	4.2	23	788	23.0	11.73
3,900	9 49	14 20	4.1	23	780	24.0	12.20
4,000	10 11	14 55	3.8	23	773	25.5	12.62
4,100	10 33	15 30	3.7	22	766	26.5	13.05
4,200	10 57	16 05	3.6	22	759	28.0	13.48
4,300	11 21	16 40	3.5	21	752	30.0	13.91
4,400	11 45	17 16	3.4	21	745	—	14.35
4,500	12 03	17 52	3.3	20	738	—	14.80

RANGE TABLE FOR 40-PR. R.M.L. GUN (SHRAPNEL)

Based on Practice of 10th, 11th and 12th June, 1891.

Charge, { weight, 6½ lbs.
gravimetric density, $\frac{15.3}{1.812}$
nature of powder, R.L.G.⁴ Projectile, { nature, Shrapnel Shell.
weight, 42½ lbs.

Muzzle velocity, 1,350 f.s.

Jump, 11 minutes.

Nature of Mounting for which jump is calculated, travelling siege.

Range.	Elevation.	5 minutes' elevation increases or decreases the range by	5 minutes will alter point of impact vertically or laterally at each range.	Remain- ing velocity.	Time of flight.	Angle of descent.	Fuze scale.	
							Range.	Length of fuze.
yards.	° ' "	yards.	yards.	f.s.	secs.	° ' "	yards.	
0	0	50	0.14	1320	0.23	12	120	0.5
100	0	50	0.23	1292	0.52	24	220	1
200	9	49	0.43	1265	0.76	36	320	1.5
300	20	48	0.58	1238	1.00	47	420	2
400	31	48	0.72	1211	1.25	59	520	2.5
500	42	47	0.87	1185	1.50	1 10	620	3
600	54	46	1.01	1163	1.75	1 23	720	3.5
700	1 6	46	1.16	1140	2.00	1 36	820	4
800	1 18	45	1.31	1118	2.26	1 50	920	4.5
900	1 30	44	1.45	1098	2.52	2 4	1020	5
1000	1 42	43	1.60	1078	2.78	2 20	1120	5.5
1100	2 6	42	1.74	1059	3.05	2 36	1220	6
1200	2 18	41	1.89	1042	3.32	2 52	1315	6.5
1300	2 32	40	2.03	1016	3.60	3 9	1410	7
1400	2 46	40	2.18	1000	3.87	3 27	1505	7.5
1500	3 0	39	2.32	985	4.15	3 45	1600	8
1600	3 14	38	2.47	972	4.42	4 4	1695	8.5
1700	3 28	37	2.61	963	4.70	4 24	1790	9
1800	3 42	36	2.76	950	5.00	4 44	1885	9.5
1900	3 56	35	2.91	941	5.30	5 4	1980	10
2000	4 10	35	3.05	932	5.62	5 26	2070	10.5
2100	4 25	35	3.21	923	5.95	5 48	2160	11
2200	4 40	35	3.34	914	6.26	6 12	2250	11.5
2300	4 56	34	3.49	906	6.58	6 36	2340	12
2400	5 12	34	3.63	898	6.91	7 0	2425	12.5
2500	5 28	33	3.78	890	7.25	7 24	2510	13
2600	5 45	32	3.92	882	7.59	7 48	2595	13.5
2700	6 2	32	4.07	874	7.94	8 12	2680	14
2800	6 19	31	4.21	866	8.30	8 36	2765	14.5
2900	6 30	30	4.36	858	8.65	9 5	2850	15
3000	6 51	29	4.51	851	9.02	9 21	2930	15.5
3100	7 12	28	4.65	844	9.40	9 58	3010	16
3200	7 31	27	4.80	837	10.16	10 24	3090	16.5
3300	7 50	26	4.94	830	10.54	10 51	3165	17
3400	8 10	25	5.09	823	10.93	11 18	3240	17.5
3500	8 30	24	5.23	816	11.35	11 46	3315	18
3600	8 50	23	5.38	809	11.76	12 13	3390	18.5
3700	9 11	22	5.52	802	12.18	12 41	3460	19
3800	9 32	21	5.67	795	12.60	13 8	3530	19.5
3900	9 54	20	5.81	788	13.01	13 36	3600	20
4000	10 17	19	5.96	781	13.42	14 6	3665	20.5
4100	10 40	18	6.10	774	13.86	14 36	3730	21
4200	11 3	17	6.25	767	14.30	15 6	3790	21.5
4300	11 26	16	6.50	760	14.74	15 36	3850	22
4400	11 50	15	6.65	753	15.00	16 10	3910	22.5
4500							3965	23
							4020	23.5
							4070	24
							4120	24.5
							4165	25
							4210	25.5
							4250	26
							4290	26.5
							4325	27
							4360	27.5
							4390	28
							4420	28.5
							4450	29
							4475	29.5
							4500	30

DRILL FOR 40 PR. R.M.L. GUN ON TRAVELLING SIEGE CARRIAGE WHEN USED AS ARMAMENT FOR GENERAL DEFENCE.

A gun detachment consists of a Gun Captain, a Gun Layer, and six other Gun numbers, also two limbers, Nos. 8 and 9.

It falls in two deep, the Gun Captain being on the left of the front rank, and the Gun Layer covering him.

TO TELL OFF.

Gun Group Commander.

— *Group Tell off.*

Gun Captain.

— *Tell off.*

At "Tell off" the Gun Captain takes a pace to his front, turns to his right, and gives the word, "—Tell off."

The Gun Layer does not number.

The right hand man of the rear rank numbers 2, the right hand man of the front rank 3, the second man from the right of the rear rank 4, his front rank man 5, and so on.

After the detachment is told off, the Gun Captain falls in again on the left of the front rank.

If the gun is unlimbered, the detachment is marched into the battery and halted in line facing the front, and to the rear of the trail and when limbered up two yards in rear of the muzzle of the gun. The detachment is now in position of "detachment rear."

If more than one gun of a group is being manned, each Gun Captain marches his detachment to his gun as above, or to such other convenient position under cover as the Gun Group Commander may direct.

GENERAL DUTIES.

The Gun Captain commands, and is responsible to the Gun Group Commander for the regular and efficient service of the gun in all respects.

The gun is never to be fired without his word of command.

At practice he is responsible that the Gun Layer knows the target ordered.

When time fuzes are employed he bores them.

N.B.—In exceptional cases, the Gun Captain may also have to perform the duties of Gun Group Commander.

It is recommended that, when feasible, this non-commissioned officer should have permanent charge of the gun, and be responsible for its condition and cleanliness, and all stores, etc., connected with it, and also for the emplacement in which it is mounted.

The Gun Layer.—His special duty is the laying of the gun. When laying at a moving target, the Gun Layer will invariably lay on the bow water line, unless otherwise ordered by the Gun Group Commander.

He directs the elevating and traversing numbers by signal or otherwise.

He always attends to vent and makes ready.

No. 2 searches, rams home, replaces rammer, runs up, traverses and sponges.

No. 3 loads, uncaps fuze or removes safety-pin, rams home, runs up and traverses.

No. 4 supplies side-arms, runs up, elevates and fires.

No. 5 runs up and assists 7.

No. 6 supplies 3 with cartridges.

No. 7 attends to fuzes and brings up projectiles.

Nos. 8 and 9 attend to limber (when with gun) and serve out ammunition.

TO PREPARE FOR ACTION AND EXAMINE GUN.

<u>Gun Group Commander.</u>	<u>Gun Captain.</u>
—Group prepare for action and Examine gun.	—Prepare for action. —Examine Gun.

At "Prepare for Action" each number brings up his stores as follows:—

The Gun Layer, sights, tubes, tube box, lanyard, pricker, and vent-server, and for drill a drill tube.

No. 2, 6 ft.-handspike and side-arms.

No. 3, 6 ft.-handspike.

No. 4, 6 ft.-handspike and elevating wheel.

No. 5, 6 ft.-handspike.

No. 6, bucket filled and brush, two cartridge cases, and, for drill a drill cartridge.

No. 7, Fuzes and fuze implements, piece of chalk, waste, and for drill a drill shell.

The stores will be laid down as follows:—

Gun Layer receives the tubes from the shell store or limber. He straps the tube box round his waist on right side, coils up the lanyard and places it under the belt. He fixes sights, taking care that the foresights fit correctly, and that the deflection leaves of the hind sights work easily. He places the pricker in the loop on the side of the carriage, examines the vent-server and places it in the vent with the loop over one of the hind sights. Places his handspike in rear of the trail, bevel up, point to the front, clear of the recoil.

No. 2 places the side-arms on the right of the gun clear of the wheels heads to the rear, rammer next gun. He places his handspike close to the wheel point to the front, bevel up, centre of the handspike in line with the axletree.

No. 3 places his handspike close to the wheel, point to the front, bevel up, centre of the handspike in line with the axletree. He removes the tampeon, placing it on the right of 5 when under cover.

No. 4 places on the elevating wheel, assists 2 to arrange side-arms; he places his handspike inside of 2's, and about 2 feet in rear, point to the front, bevel up.

No. 5 places his handspike inside of 3's and about 2 feet in rear, point to the front, bevel up.

No. 6 places the sponge bucket and brush near the sponge head, and takes the cartridge cases to the limber.

No. 7 places the time fuzes, hook borer, and piece of chalk in a convenient position for the Gun Captain.

The Gun Captain now gives "Examine gun," and sees that the gun itself is properly examined by the numbers whose duty it is to do so, and that the fuzes and fuze implements are brought up and

are ready to his hand, and that a piece of paper is placed in the gas escape hole. He receives reports from the numbers responsible of any irregularity or deficiency in connection with the different parts of the gun, carriage, stores, etc.

Gun Layer drifts the vent and replaces pricker and vent-server.

No. 2 supplies himself with a searcher and searches the gun, taking care the pricker is not in the vent, and replaces searcher, he then supplies himself with the sponge, sponges, and replaces it:

3 examines the bore to see that it is clear, and that the grooves are free from grit.

4 sees that the elevating gear is oiled and in working order.

After each number has completed his work as above, he goes "under cover."

The positions of the various numbers "under cover" are as follows. They should then, if possible, be sitting or lying down:—

Gun Captain. Where he can best regain his position for superintending the working of the gun.

Gun Layer. On the left of 4.

Nos. 2 and 4 on the right of the gun, 2 next the muzzle.

Nos. 3 and 5 on the left of the gun, 3 next the muzzle.

Nos. 6 and 7 in rear of the limber wheels on their own sides.

Nos. 8 and 9 in rear of the limber.

TO LOAD.

Gun Group Commander.

— *Group.*
— *Load.*

Gun Captain.

— *Gun.*
— *Load.*

The Gun Layer attaches a tube to the lanyard, folds the lanyard in two and lays it on the breech, with the stoggle hanging over the right side.

No. 6 brings up a cartridge in a case, and places it on the ground on 3's right front, uncovers it, and as soon as 3 has withdrawn the cartridge he returns with case to the limber.

No. 7 brings up a shell, point to his right, having fixed the fuze.*

No. 3 takes the cartridge from the case with his left hand, moves up and places it in the bore; he then shows his body to his right and receives a shell from 7 and puts it in the bore, withdraws the safety pin or uncaps the fuze, and places himself in a position to assist 2 to ram home. After the shell is ramed home he quits the stave and goes under cover.

No. 4 doubles out, halts in line with the rammer head, turns to his left, picks up the stave with his right-hand, back under, 6 in from the head turns three quarters left about, and in doing so lifts the rammer over his head, allowing the end of the stave to rest on the ground. His left hand meets the stave close to the rammer, his right hand is slipped up the stave about 2 feet; he then moves towards the muzzle and passes the stave in such a manner that 2 can conveniently lay hold of it, and goes under cover.

No. 2 places himself in a convenient position for ramming home. He places his left foot in line with and about 12 inches from the muzzle, steps to his right with his right foot, and looks to his left rear, takes the rammer in a horizontal position from 4, right hand

* 7 fixes percussion fuzes, and after they have been bored by the Gun Captain, time fuzes.

about the centre back down, left as near the head as possible, back up; as soon as the cartridge and the shell are put in, he enters the head into the bore, and, assisted by 3, forces them home hand over hand, when home 2 springs the rammer, steps out, replaces the rammer, and goes under cover.

The Gun Captain now gives the signal to "*Run up*," by raising both arms vertically above his head.

At this signal, 2, 3, 4 and 5 take up their handspikes at the centre, with the hands next the parapet back up, the other hands at the small end back down; 2 and 3 apply their handspikes horizontally over the spokes of the wheels in front under the brackets, close to the breast, and bear down; 4 and 5 use theirs as levers of the second order under the rear part of the wheels, all the numbers at the end of their handspikes, facing to the rear; the Gun Layer applies his handspike under the trail eye and guides the gun into the line of fire. As soon as the gun is run up, the Gun Captain gives the signal "*Halt*," by raising his right arm. The Gun Layer slides his right hand back up, to the centre of the handspike, and throws it to the rear, he then stands ready to lay his gun, 2 and 3 stand in line with the trail eye facing the front, holding their handspikes diagonally across the body, outward hands at the small ends as high as the ears, inward hands resting on the handspike at the full extent of the arm, bevelled side of the handspikes uppermost, Nos. 4 and 5 lay their handspikes down, 4 goes to the elevating wheel ready to elevate, 5 goes under cover.

MAKING READY, ELEVATING, AND TRAVERSING.

The Gun Layer then proceeds to lay his gun, steadying himself by leaning on the caseable.

At "*Trail right*," 3 heaves over trail, and at "*Trail left*," 2 heaves it over.

N.B.—When the gun is mounted on Clerk's platform at extreme right (or left), 2 and 3 apply their handspikes, and with 4 and 5 heave over the side pieces, drawing out the iron bolts in rear for that purpose; when it is necessary to shift the trail plank, 2 and 3, using the side pieces as fulcrums, place the points of their handspikes under the trail handles, and raise the trail; 4 doublemans 2's handspike; Gun Captain and 5 shift the plank.

To run back; 2 and 3 apply their handspikes in front of the wheels, using them as levers of the second order, 4 and 5 take a purchase with theirs over the most convenient spokes in rear and under the brackets, the whole facing to the rear.

When firing at a stationary target; the Gun Layer as soon as he has received the final range and laid his gun, steps clear of the recoil. The Gun Captain then gives the command "*Take post*," the detachment then take post until, the order, "*— Group*," or "*— Gun Commence Firing*," is given.

GUN LAYERS SIGNALS.

The Gun Layer gives direction to the elevating number in a low tone of voice.

For direction he gives the following signals to the traversing numbers. "*Trail Right or Left*."—He motions with his hand, his fingers pointing in the required direction. "*Halt*."—He slaps his thigh.

LAYING AND FIRING.

Case I. *When elevation and direction are given by tangent scale.*—The Gun Layer lays his gun with the elevation and deflection ordered by the Gun Group Commander, until the final range be given as follows:—

FINAL RANGE.

<i>Gun Group Commander.</i>		<i>Gun Captain.</i>
— <i>Group,</i>		— <i>Gun,</i>
or		— <i>Yards Lay.</i>
— <i>Gun,</i>		
— <i>Yards Lay.</i>		

At the order "Lay," all the Gun Layers, or only the one of the gun named, as the case may be, adjust the tangent sights to the exact elevation ordered.

If firing is to commence as soon as possible after loading the Gun Group Commander should give the "final range" immediately the gun (or guns) is loaded and run up.

COMMENCE FIRING.

<i>Gun Group Commander.</i>		<i>Gun Captain.</i>
— <i>Group,</i>		(On seeing Gun Layer clear of
or		recoil.)
— <i>Gun,</i>		— <i>Gun Fire.</i>
<i>Commence Firing.</i>		

At the order "Commence Firing," the Gun Layers of the group, or the gun named, will rapidly make any final corrections of the laying that may be necessary.

The Gun Layer places the tube in the vent, throws the toggle over the right side of the carriage and gets clear of the recoil, and holds his right hand above his head, 2 and 3 laying down their handspikes, go under cover, 4 seizes the lanyard, and on the order "Fire," from the Gun Captain, fires. As soon as the gun is fired, 4 hands the lanyard to the Gun Layer who places it under his tube box strap.

SPONGING OUT.

As soon as the gun is fired, the Gun Layer drifts the vent, replaces the prickler and vent-server, 4 supplies the sponge, 2 receives it in a horizontal position, left hand back down, right hand back up, and brings it in line with the axis of the gun, enters the head into the bore, being careful to observe that the vent-server is in the vent, slides his hands along the stave to his right as far as he can reach, sends the sponge up the bore, slides his hands out again and forces the sponge hard home, giving it two half turns, pressing it against the bottom of the bore, withdraws the sponge hand over hand, turning it from him, cleaning the bore well; when the sponge arrives near the muzzle, he jerks it out; his hands should then be in the position they were when he introduced the sponge into the bore. He then hands the sponge to 4 who replaces it.

TO RUN BACK AND UNLOAD AT DRILL.

To run back is the converse of running up.

The gun is unloaded by the same numbers that loaded it, 4 supplying searcher. As soon as the gun is unloaded, 4 supplies the sponge and 2 sponges out, as detailed above.

TO CEASE FIRING AND REPLACE STORES.

<i>Gun Group Commander.</i> <hr/> <i>Group,</i> <i>Cease Firing and replace stores.</i>	<i>Gun Captain.</i> <hr/> <i>Gun,</i> <i>Cease Firing and replace stores.</i>
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The Gun Captain sees that the gun is depressed to an angle of about 4 degrees. The stores are replaced by the numbers who brought them up.

After replacing stores, the detachment falls in, two deep, in rear of the gun as at first.

The following movements will be required at times.

TO TAKE POST UNDER COVER AND FORM DETACHMENT REAR.

To take Post Under Cover.

<i>Gun Group Commander.</i> <hr/> <i>Group take post under cover.</i>	<i>Gun Captain.</i> <hr/> <i>Double March.</i>
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Each man doubles to his position as follows:—

Gun Captain.—Where he can best regain his position for superintending the working of the gun.

Gun Layer.—On the left of No. 4.

Nos. 2 and 4 on the right of the gun, 2 next the muzzle.

Nos 3 and 5 on the left of the gun, 3 next the muzzle.

No. 6 outside the cartridge store.

No. 7 outside the shell store.

Nos. 8 and 9 to ammunition stores.

To Form Detachment Rear.

<i>Gun Group Commander.</i> <hr/> <i>Detachment Rear.</i>	<i>Gun Captain.</i> <hr/> <i>Double March.</i>
--	---

The Gun Captain doubles out and places himself at the rear of the platform, facing to the front; on the word "*Double March*," the numbers double to their places in "*Detachment Rear*," halting and fronting as they come up.

For detail of limbering up, unlimbering, and shifts, &c., see drill for 40 Pr. R.M.L., when used with siege train.

GUNS ON OVERBANK CARRIAGES.

The service of the guns is the same as that just detailed, with the following exceptions.

The gun is run up till the muzzle is 3 or 4 feet from the parapet to load, 3 then depresses the muzzle (by means of the elevating

wheel which is in front of the carriage) till it is about a foot below the interior crest.

A sponge with wire rope stave and jointed rammer are used. The sponging is performed in the ordinary manner. The rammer is handed to 2 folded up. It is passed into the bore one length at a time, the second length being straightened out and the collar slipped over the joint when the end of the first length reaches the muzzle, and so on. Withdrawing it is the converse of the above.

The rammer should be turned in entering and withdrawing it, so as to allow the portion of it outside the bore to hang downwards.

Before finally withdrawing the rammer, 2 keeps a steady pressure on the rammer, while 3 elevates till the muzzle of the gun is nearly in line with the interior crest. The rammer is then withdrawn, and 3 elevates till the axis of the gun is about 3 degrees elevation.

The gun is then run up.

In laying the Gun Layer stands on the trail. He must carefully note that the trail plank under the point of the trail is well supported. If it is not, the removal of his weight from the trail after he has finished laying will cause the trail to rise and the muzzle to be depressed. The shooting would therefore be inaccurate.

DRILL WITH 40-PR. RIFLED M.L. GUN.

When used with Siege Train.

The detachment consists of nine numbers, and falls in two deep in rear of the gun, which is limbered up.

TO TELL OFF.

Officer.

No. 1.

Tell off.

At "Tell off."—No. 1 (who is on the left of the detachment) takes a pace to his front, turns to his right, and numbers himself 1; the right-hand man of the rear rank numbers 2; the right-hand man front rank 3; the second man from the right of the rear rank 4; the man in his front 5; and so on; after the detachment is told off No. 1 falls in again on the left of the front rank.

No. 1 then straps on the fuze pocket on his right side, and 5 the tube pocket.

The front is that direction in which the gun is pointed when unlimbered, or to which, when limbered up, the horses' heads are turned.

POSITION OF DETACHMENT WHEN LIMBERED UP.

In Order of March.

No. 1 in line with the point of the near shaft and two yards on the left of it.

Nos. 2 and 3 in line with the axletree of the gun carriage.

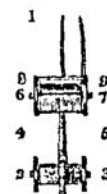
Nos. 4 and 5 in line with the centre of the trail.

Nos. 6 and 7 in line with the axletree of the limber.

Nos. 8 and 9 in line with the splinter bar.

The Nos. stand covering, one yard from the wheels.
(Fig. 1.)

Fig. 1.



In Rear.

Two deep, two yards in rear of the muzzle of the gun.

TO FORM THE ORDER OF MARCH FROM DETACHMENT REAR.

Officer.No. 1.*Form the order of march.**Left turn, Double march.*

No. 1 heads the rear rank; the front rank file into their places on the right, and the rear rank on the left of the gun, each number halting when in his place.

TO FORM DETACHMENT REAR FROM THE ORDER OF MARCH.

Officer.No. 1.*Detachment rear.*

*About turn, Double march.
Halt, Front.*

Nos. 2 and 3 close to the centre, and wheel to their left, marking time when opposite the off wheel and two yards from it; as soon as the detachment has closed up it is halted and turned to the front.

TO CHANGE ROUNDS WHEN THE GUN IS LIMBERED UP.

The detachment being at the "order of march" in changing rounds.

No. 2 becomes No. 4; 4, 6; 6, 8; 8, 1; 1, 9; 9, 7; 7, 3; 3, 2.

TO UNLIMBER.

This must be done when the gun is in the firing trunnion holes.

Officer.No. 1.*Unlimber.*

*Prepare to unlimber.
Lift.
Limber drive on.
Lower.*

"*Prepare to unlimber.*"—No. 1 unkeys the keep chain and with 2, 3, 4, 5, 6, and 7 stands to the trail, 2 and 3 nearest the gun. If there are no horses 9 goes to the shafts, and 8 to the splinter bar on the near side.

At "*Lift*" the trail is lifted clear of the pintail, at "*Limber drive on*" the limber moves on, and at "*Lower*" the trail is lowered to the ground.

TO LIMBER UP.

Officer.No. 1.*Limber up.*

*Prepare to limber up.
Lift.*

The several numbers place themselves as for unlimbering, and at "*Lift*" lift the trail on to the pintail, No. 1 keys up.

When unlimbering or limbering up guns mounted on overbank carriages, great care should be taken *not to raise the trail too high*, as it is apt to fly up and escape from the control of the men lifting it, in which case the gun pitches violently over on to its muzzle, and may become dismounted.

TO SHIFT A 40-PR. R.M.L. GUN, ON TRAVELLING SIEGE CARRIAGE,
FROM TRAVELLING TO FIRING TRUNNION HOLES.

This must be done while the gun is limbered up
Strength of Detachment.—One gun detachment.

<u>Officer.</u>	<u>No. 1.</u>
Shift from travelling to firing trunnion holes.	Prepare to shift the gun. Prepare to bear down. Bear down. Come up. Prepare to lift. Lift and heave. Prepare to bear down. Bear down. Come up.

"Prepare to shift the gun."—2, 3, 4 and 5 cast loose side-arms and handspikes and unbuckle straps should the gun be so secured; 2 and 3 take off cap-squares; 4 and 5 scotch the gun wheels with handspikes, 4 in front, 5 in rear.

"Prepare to bear down."—2 places his handspike in the bore double manned by 3; 4 passes a handspike across 2's to 5; 8 and 9 make fast two drag-ropes to the breech, and pass the ends towards the muzzle; 8 and 9 then double man 2's handspike. A check rope should be made fast to the cascable and axletree bed of limber by No. 9.

"Bear down."—2, 3, 4, 5, 8, and 9 bear down; 7 hands the roller to No. 1, who places it as near as possible under the centre of gravity and gives

"Come up."

"Prepare to lift."—4 crosses his handspike under that in the bore to 5; 1, 6, and 7 man the ropes.

"Lift and heave."—The bends of the arms are placed under the handspikes; the gun is raised out of the travelling holes and hauled forward until the trunnions fall into the firing holes. The handspike men should keep their eyes fixed on the gun so as to be prepared for its descent. As soon as the gun is in the trunnion holes the drag-ropes are cast off by 8 and 9.

"Prepare to bear down."—4 reverses his handspike and places it over that of 2.

"Bear down."—7 withdraws the roller, and straps it on the carriage: 1 and 6 put on the elevating gear.

"Come up."—2 and 3 replace the cap-squares, 4 and 5 unscotch; 2, 3, 4 and 5 replace sidearms and handspikes.

TO SHIFT FROM FIRING TO TRAVELLING TRUNNION HOLES.

The operation of shifting from firing to travelling trunnion holes is the converse of the above, except that one drag-rope only is required made fast to the breech and led to the front, but the roller should be placed with its centre opposite the rear of the horns of the travelling trunnion holes. The breech can be raised with handspikes to enable the roller to be drawn back but it need not be taken out. The gun is secured by straps to the carriage for travelling.

TO SHIFT A 40-PR. R.M.L. GUN ON OVERBANK CARRIAGE FROM FIRING TO
TRAVELLING TRUNNION HOLES.

This must be done while the gun is limbered up.

Strength of Detachment.—About 19 Nos; or, say, two gun detachments.

Stores required.—The stores required, in addition to those on the gun, are as follows, viz. :—

Luff tackles, complete ..	..	..	..	..	3
Selvagees ..	..	..	..	..	2
Breech loop ..	..	..	..	..	1

The special gun roller, when in use, rests on two gudgeon plates fitted to the cheeks of the overbank to top carriage; when not in use the brackets fold down.

Officer.

*Shift from firing to
travelling trunnion holes.*

No. 1.

*Prepare to shift the gun.
Hook tackles,
Prepare to bear down.
Bear down.
Come up.
Hook tackles.
Prepare to lift.
Lift and heave.
Halt. Lower.
Prepare to bear down.
Bear down.
Heave and ease off.
Cast of tackles.*

"*Prepare to shift the gun.*"—2, 3, 4 and 5 cast loose side-arms, hand-spikes, remove elevating arc, fittings, &c.; 2 and 3 remove cap-squares; 4 and 5 scotch the wheels with handspikes, 4 in front, 5 in rear; 8 and 9 lash trail eye to axletree bed of limber with a drag rope.

"*Prepare to bear down.*"—2 places a handspike in the bore, and makes fast a drag-rope to end of it; double manned by 3, 8 and 9; 6 hands roller to 1.

"*Bear down.*"—2, 3, 8 and 9 bear down. No. 1 places roller and gives

"*Come up.*"

"*Hook tackles.*"—No. 1 places breech loop on cascable; 6 and 7 hook the double blocks to it; 4 and 5 the single blocks to the eye bolts on breast of carriage; they take in the slack, and stand ready for easing off, assisted by 6 and 7; 9 hooks the double block of tackle to cascable; 8 the single to trail plate eye using selvagees for this purpose, they take in the slack, and pass the fall to the front.

"*Prepare to lift.*"—All the numbers above 9 man the breech tackle.

"*Lift and heave.*"—2, 3, 8 and 9 lift; 4, 5, 6 and 7 ease off a little, the remainder haul on breech tackle until the trunnions are over the flat part of the brackets; when No. 1 gives "*Halt, Lower*"; 2, 3, 8 and 9 lower the trunnions on to the brackets, the breech-tackle Nos. easing off at the same time.

"*Prepare to bear down.*"

"*Bear down.*"—No. 1 removes roller, and throws back catches.

"*Heave and ease off.*"—4, 5, 6 and 7 ease off; 2, 3, 8 and 9 steady the muzzle; remainder haul on breech tackle.

"Cast off tackles."—The tackles are cast off by the same numbers that hooked them; the gun is secured by straps to the carriage for travelling, the cap-squares and stores being replaced.

TO SHIFT FROM TRAVELLING TO FIRING TRUNNION HOLES.

<u>Officer.</u>	<u>No. 1.</u>
<i>Shift from travelling to firing trunnion holes.</i>	<i>Prepare to shift the gun.</i>
	<i>Hook tackles.</i>
	<i>Arrange muzzle handspike.</i>
	<i>Taut. Heave.</i>
	<i>Cast off tackles.</i>

"Prepare to shift the gun."—As before, 8 and 9 lash trail eye to axletree bed of limber with a drag rope.

"Hook tackles."—As before.

"Arrange muzzle handspike."—As before.

"Taut. Heave."—2, 3, 8 and 9 steady the muzzle; 19 cases off check tackle, the remainder man the falls of the hauling tackles on their own sides; as soon as the trunnions rest on the flat part of the carriage brackets, 6 and 7 place points of handspikes in the trunnion holes to receive the gun. The handspikes can be worked out, but as doing so often breaks their points it is better to take a lift and clear them.

"Cast off tackles."—As before.

TO TAKE POST UNDER COVER.*

<u>Officer.</u>	<u>No. 1.</u>
<i>Take post under cover.</i>	<i>Double march.</i>

The numbers double to their positions as follows:—2 and 4 on the right of the gun, 3 and 5 on the left of the gun, 1 on the left of 4, 2 and 3 next the muzzle. The whole are close to the parapet, facing the rear, 6 and 8 go to the cartridge store, 7 and 9 to the shell store.

DRILL ON CLERK'S PLATFORM.†

GENERAL DUTIES.

‡No. 1 commands, directs or superintends boring and fixing of fuzes, runs up, records readings of sights and clinometer,§ and lays.

No. 2 searches, rams home, replaces rammer, runs up, traverses, and sponges.

No. 3 loads, uncaps or removes safety pin from fuze when in bore, rams home, runs up, and traverses.

* If the gun is not behind a parapet and the word of command is "Take post at the gun," the detachment wheels to its left as before, 2 and 3 halt in line with the front of the wheels, 4 and 5 with the rear of the wheels, No. 1 in rear of the gun, 6, 7, 8, 9 at the limber.

† To place gun on platform, see page 11.

‡ When from any cause the No. 1 is not the layer, the duties of 1 and 4 will be:—No. 1 commands, directs or superintends the boring and fixing of fuzes, attends to side-arms, and supplies them to 2, runs up and elevates. No. 4 runs up, records readings of sights and clinometer, and lays.

§ Readings are not recorded if firing at a moving target.

No. 4 attends to side-arms and supplies them to 2, runs up, and elevates.

No. 5 runs up, makes ready, fires, and attends to vent.

No. 6 supplies 3 with cartridges.

No. 7 attends to fuzes and brings up projectiles.

No. 8 attends to cartridge store and serves out cartridges to 6.

No. 9 attends to shell store, issues shells, tubes, and fuzes.

The instructor should ascertain that each number is at his post by proving. This he does by calling out No. 1 "*Prove*," No. 2 "*Prove*," &c. The man called upon raises his right arm and extends it smartly to the front, hand open, thumb upwards, hand as high as the shoulders. When the next number is called he drops his hand. The last number lowers his hand at the word "*Down*."

On all occasions before giving a word of command, No. 1 should repeat the number of his gun.

Loading should be performed as rapidly as is consistent with the proper performance of all the duties, avoiding confusion.

The cartridge should be kept covered until the sponge is out of the bore.

A sponge for rifled guns should be high, it should be allowed to take the twist of the rifling, and forced to the bottom of the bore.

TO PREPARE FOR ACTION.

<u>Officer.</u>	<u>No. 1.</u>
<i>Prepare for action.</i>	<i>Prepare for action.</i>
	<i>Examine guns.</i>

"*Prepare for action*."—The stores are brought up as follows:—

No. 1, handspike, sights, clinometer, piece of chalk, and 50 feet tape.

No. 2, large Scotch handspike, and assists 4 with side-arms.

No. 3, large Scotch handspike, 2 banderols; removes the tampecon from the muzzle.

No. 4, handspike, elevating wheel, side-arms, and support for head of side-arms.

No. 5, handspike, tubes in pocket, lanyard, pricker, and vent-server.

No. 6, two cartridge cases, which he leaves at the cartridge store, bucket filled, and brush. For drill purposes two drill cartridges.

No. 7, fuzes and fuze and shell implements. He obtains the fuze boxes from 9, having ascertained from No. 1 the fuzes required; and satisfies himself as to the correctness of fuzes and fuze implements.

No. 8 prepares to issue cartridges.

No. 9 prepares to issue shells, friction tubes, and fuzes. He examines the shells carefully, cleaning them if necessary and removing burrs from studs: he loosens the fuze hole plugs of shells that will be first issued, and sees that the gas-checks are properly fitted and the projections aligned with the studs on the shell.

The stores having been brought up, No. 1 will satisfy himself that the fore sights fit properly on the gun and the deflection leaves of the hind sights work easily, that the sights are at zero; if French sights are used that the sliding leaves are clamped at fourth graduation; he receives the reports from the Nos. responsible of any irregularity or deficiency in connection with the gun, ammunition, or stores.

The sponge, rammer, and banderols, are laid on the ground clear of the platform, to the right of the gun and parallel to it, heads to

the rear, resting on the support supplied by 4, rammer nearest the gun. The wadhook and extractor are laid on the ground clear of the piece.

The sponge bucket near the sponge head.

The handspikes are laid down, two on each side of the gun close to the carriage, points to the front, bevelled side uppermost, those of 2 and 3 outside, and about two feet in advance of those of 4 and 5. No. 1's handspike in rear of the platform. The scotches are placed by 2 and 3 convenient for use.

No. 3 examines the bore to see the grooves are free from grit, &c., and if necessary gives "Sponge out."

No. 4 ascertains that the elevating gear is in working order (should the elevating arc have been detached from the carriage he brings it up and adjusts it).

No. 5 straps the tube pocket round his waist on the right side, coils up the lanyard, and passes the bight of it through the tube pocket strap; examines the vent-server, and places it in the vent, the loop of the vent-server lanyard over one of the sights; he fills his tube pocket with friction tubes which he procures from 9, and places the pricker in the loop on the carriage.

N.B.—Should the stores be on the gun, they are unstrapped and laid down as above detailed.

"*Examine gun.*"—No. 5 drifts the vent, replaces the pricker in the loop and the vent-server. 2 supplies himself with the wadhook, searches the gun after the pricker has been withdrawn, and replaces wadhook. 4 attends to the elevating wheel to bring the gun into a convenient position for loading. The piece should be at about 5 degrees elevation to facilitate uniform ramming home, and a chalk mark should be made on the piece in line with the bracket of the carriage so that for future rounds the piece may be readily got into the same position. When satisfied that the gun is ready for action the No. 1 will report to his Group Officer.

TO LOAD.

Officer.

*With—load.**

No. 1.

With—load.

"*Load.*"—The No. 1 gives 7 the nature of shell and fuze required. He places himself in a convenient position, near the muzzle, whence he can watch the loading and observe, by the mark on the rammer, if the shell is home.

No. 2 places himself in a convenient position for ramming home. He places his left foot in line with and about 12 inches from the muzzle, steps to his right with his right foot and looks to his left rear, takes the rammer in a horizontal position from 4, right hand about the centre back down, left hand near the head back up. The rammer stave should be marked, so as to show when the round is home, and a mark should be made, one foot nearer the head. As soon as the fuze is uncapped, 2 assisted by 3 rams home hand over hand till the first mark comes against the muzzle, 2 and 3 then halt and reach out as far down the stave as they can, and wait for the word "home" from No. 1. On that word 2 and 3 ram home together,

* If the command is "With shell load," common shell and percussion fuze is implied.

throwing all their weight back on the rammer, keeping their arms straight, 2 then springs the rammer, steps out and replaces it and goes under cover.

No. 3 takes the cartridge from the cartridge case with his left hand, moves up and places it in the bore; he then slews his body to his right and receives a shell from 7 and puts it in the bore, withdraws the safety pin, or uncaps the fuze, places himself in a corresponding position to 2, and assists him to ram home; when the cartridge and projectile are home he quits the stave and goes under cover.

No. 4 doubles out, halts in line with the rammer head, turns to his left, picks up the stave with his right hand back under, 6 inches from the head, turns three-quarters left about, and in doing so lifts the rammer over his head, allowing the end of the stave to rest on the ground. His left hand meets the stave close to the head, his right hand is slipped up the stave about 2 feet. He then moves towards the muzzle and places the rammer in a convenient position for 2 to lay hold of, and goes under cover.

No. 6 brings up a cartridge in a case and places it on the ground on 3's right front; he uncovers it, and as soon as 3 has withdrawn the cartridge, he takes the case back to the cartridge store.

No. 7 brings up a shell, point to his right, having fixed the fuze according to No. 1's directions, and hands it to 3.

No. 8 issues a cartridge to 6.

No. 9 issues a shell to 7. (With 40 pr. and 6.3-in. howitzer, the gas-checks must be properly attached.)

TO RUN UP, OR BACK.

Directly the gun is loaded, the No. 1 gives "*Run up*," and applies his handspike between the brackets of the trail to guide the gun.

Nos. 2, 3, 4, 5, take up their handspikes; 2 and 3 unscotch and apply theirs horizontally over the spokes of the wheels in front, and under the bracket close to the breast, and bear down; 4 and 5 use theirs as levers of the second order under the rear part of the wheels. All four numbers face to the rear.

When the gun is run up, the No. 1 gives "*Halt*," slides his handspike to the rear clear of the recoil, and looks over the sights, steadying himself by leaning on the cascable. 2 and 3 go to the end of the trail facing to the front ready to traverse; 4 and 5 lay down their handspikes; 4 goes to the elevating wheel; 5 prepares a tube.

If it is necessary to run the gun back at "*Run back*," 2 and 3 apply their handspikes in front of the wheels, using them as levers of the second order; 4 and 5 take a purchase with theirs over the most horizontal spokes in rear and under the brackets; the whole facing to the rear.

TO LAY THE GUN.

<u>Officer.</u>	<u>No. 1.</u>
<i>Range</i> —yards (or elevation.)	<i>Trail right.</i>
<i>Deflection</i> —right or left.	<i>Trail left.</i>
	<i>Halt.</i>
	<i>Elevate.</i>
	<i>Depress.</i>
	<i>Halt.</i>

No. 1 records the elevation and deflection ordered and then lays the gun.

At "*Trail right*," 3 heaves over the trail, at "*Trail left*" 2, till the word "*Halt*."

At "*Extreme right or left*," 2 and 3 apply their handspikes and with 4 and 5 heave over the inclined planes, drawing out the iron bolts in the rear for the purpose; when it is necessary to shift the trail plank, 2 and 3, using the side pieces as fulcrums, place the points of their handspikes under the trail handles and then raise the trail; 4 double mans 2's hand-pike, 1 and 5 shift the plank.

At "*Elevate*" or "*Depress*," 4 turns the wheel in the required direction till the word "*Halt*."

Should no order to fire be given, when the gun is laid, No. 1 gives the order "*Under cover*," and removes his tangent scale unless firing at a moving target.

TO MAKE READY AND FIRE.

<i>Officer.</i>	<i>No. 1.</i>
<i>Fire No.</i> —	<i>No.</i> — <i>Ready.</i>
	<i>No.</i> — <i>Fire.</i>

The No. 1 gives "*Ready*"; 5 presses the tube into the vent with his right thumb, stops clear of the recoil, shifts the lanyard to his left hand and extends it, keeping his hand level with the vent, facing the front forearm across the body.

As soon as "*Ready*" is given, 2 and 3 lay down their handspikes and with 4 go under cover.

At "*Fire*" 5 slews his body to the left, and thus fires the gun; he then drifts the vent, replaces the prickler and vent-server, and goes under cover.

Directly the gun is fired, 2 and 3 scotch up the wheels, 4 steps in and brings the gun into the proper position for loading. 2 supplies himself with the sponge, and sponges out the gun as soon as the vent-server is in the vent; his position is similar to that for ramming home. He holds the sponge with the left hand back down, right hand back up, brings it in line with the axis of the gun, enters the head into the bore, being careful to observe that the vent-server is in the vent, slides his hand along the stave to his right as far as he can reach, sends the sponge up the bore, slides his hands out again and forces the sponge hard home, gives it two half-turns, pressing it against the bottom of the bore, withdraws the sponge, hand over hand, turning it from him, cleaning the bore well. When the sponge arrives near the muzzle, he jerks it out, his hands should then be in the position they were in when he introduced the sponge into the bore. He then hands the sponge to 4 and goes under cover. 4 replaces it and goes under cover.

GUNS ON OVERBANK CARRIAGES.

The service of the guns is the same as that just detailed, with the following exceptions:

The gun is run up till the muzzle is three or four feet from the parapet to load: 3 then depresses the muzzle (by means of the elevating wheel which is in front of the carriage) till it is about a foot below the interior crest.

A sponge with a wire rope stave and jointed rammer are used. The sponging is performed in the ordinary manner. The rammer is handed to 2 folded up. It is passed into the bore one length at a time, the second length being straightened out and the collar slipped over the joint when the end of the first length reaches the muzzle, and so on. Withdrawing it is the converse of the above.

The rammer should be turned in entering and withdrawing it, so as to allow the portion of it outside the bore to hang downwards.

Before finally withdrawing the rammer, 2 keeps a steady pressure on it while three elevates till the muzzle of the gun is nearly in line with the interior crest. The rammer is then withdrawn, and 3 elevates till the axis of the gun is about 3 degrees elevation.

The gun is then run up.

In laying No. 1 stands on the trail. He must carefully note that the trail plank under the point of the trail is well supported. If it is not, the removal of his weight from the trail after he has finished laying will cause the trail to rise and the muzzle to be depressed. The shooting would therefore be inaccurate.

TO MOUNT OR DISMOUNT A 40-PR. R.M.L. GUN OF 35-CWT., ON OR FROM A TRAVELLING SIEGE CARRIAGE BY LONG SKIDS UP OR DOWN THE REAR.

Strength of Detachment, about 19 Nos. (two gun detachments will suffice).

Stores Required.

Drag ropes, heavy	..	..	..	..	2
Handspikes, common, 6 ft.	..	..	..	..	5
Lashings, white or tarred, 1½-inch, 3 fms. each	..	..	..	..	4
Luff tackles, complete	..	..	..	..	2
Roller, ground, elm, 3' x 6"	..	..	..	..	1
Scotches, of sorts	..	..	..	..	12
Selvagees	..	..	..	..	2
Skids,* oak, 14' x 5½" x 5½"	..	..	..	..	2
Skids,† oak, 3' x 9" x 6"	..	..	..	..	2
Water bucket, filled, and brush	..	..	..	..	1

TO MOUNT THE GUN.

The ground roller should be placed under the gun, a little in rear of the centre of gravity, the muzzle being supported on a skid, the carriage at such a distance in front, that when the long skids are in position, their lower ends may be under the muzzle. The cap-squares are removed by 2 and 3, and the wheels scotched by 4 and 5, for which purpose large scotches are to be preferred, though handspikes can be used for the purpose.

Place skids, hook tackles.

Tant. Heave.

Remove skids, unhook tackles.

"Place skids," "hook tackles."—8, 9, 10 and 11 place the skids, the lower ends bevel down resting on a 6' x 9" on its flat; the

* Weight 160 lbs., or, if strengthened with iron plates at the sides, 203 lbs.

† Two 3-inch planks, one on top of the other, may be used to support the lower ends of the long skids instead of a 6' x 9'.

upper bevel upon the medium and small coins which are placed on the stool-bed, between the front part of the carriage brackets; the thick ends of the coins outwards, the points overlapping inwards.

The skids are cradled at their upper ends by the coins at their lower ends by two large scotches on the 6" x 9" and at an intermediate point by two medium scotches on the trail transom; they are hooked together with the hooks back up and lashed back to the trail handles, the muzzle being lowered on to the skids before they are lashed.

The tackles are then hooked; 12 and 13 hooking the double blocks to a strap round the cascable, 10 and 11 the single to a strap round the breast of the carriage. The skids are then watered.

"*Taut.*" "*Heave.*"—The Nos. man the tackles on their own sides and haul the gun up the skids until the trunnions rest on the points of handspikes placed in the firing trunnion holes by 6 and 7.

"*Remove skids.*" "*unhook tackles.*"—The muzzle is borne down and the skids and tackles cleared away by the Nos. who placed them; 6 and 7 working out their handspikes, 2 and 3 replacing the cap-squares; care should be taken to avoid fouling the worm-wheel shaft of the elevating gear with the movable block of the right luff tackle; the shaft may be removed without much difficulty by taking off the whole of the upper and the outer half of the lower gun-metal bearings of the shaft by means of a spanner.

TO DISMOUNT THE GUN.

To effect this the gun must first be raised out of the trunnion holes.

<u>Officer.</u>	<u>No 1.</u>
<i>Dismount the gun.</i>	<i>Prepare to dismount the gun.</i>
<i>Prepare to bear down.</i>	
<i>Bear down.</i>	
<i>Come up.</i>	
<i>Prepare to lift.</i>	
<i>Lift.</i>	
<i>Lower.</i>	

"*Prepare to dismount the gun.*"—2 and 3 take off cap-squares and elevating arc, 4 and 5 scotch the wheels front and rear with large scotches on their own sides.

"*Prepare to bear down.*"—2 places a handspike in the bore, double manned by 3, 8 and 9; 4 passes a handspike to 5 over that in the bore just in front of the face of the piece, double manned by 10 and 11, all facing the rear.

"*Bear down.*"—The muzzle is borne down, Nos. 1 and 6 taking off the elevating arc and patch and 7 placing the shifting roller under the breech, about 18 inches in rear of the centre of gravity and scotched up.

"*Come up.*"—The breech is allowed to rest on the roller.

"*Prepare to lift.*"—4 shifts his handspike to 5 under that in the bore.

"*Lift.*"—The gun is lifted high enough for 6 and 7 to insert a handspike in each trunnion hole.

"*Lower.*"—The gun is lowered till the trunnions rest on the handspikes.

Prepare to bear down.
Bear down.

Place skids.
Come up.
Make fast breech drag-rope.
Prepare to lift.
Taut. Lift and heave.
Remove skids.

"*Prepare to bear down.*"—As before.

"*Bear down.*"—As before, the shifting roller is moved by 7.

"*Place skids.*"—10, 11, 18 and 19 (or any of the higher Nos.) hook the skids together, hook back up, and place supports and cradle them, as in mounting; they then lash them as follows: The hook of a drag rope is placed over the lower hook of the skids, the end passed through the trail eye and made fast to the folloe of either wheel.

"*Come up.*"—The breech is lowered on to the long skids.

"*Make fast breech drag-rope.*"—11 makes fast a drag-rope (not with the hook end) to the cascable.

"*Prepare to lift.*"—The same Nos. as before prepare to lift the muzzle, the other Nos. man the breech drag-rope.

"*Taut. Lift and heave.*"—The Nos. at the muzzle lift, those on the drag-rope heave, and the gun is hauled down the long skids, which should have been previously watered, on to the ground roller placed to receive the breech.

METHODS OF LAYING.

A.—When the object fired at is visible over the sights.

1. *The tangent scale is used.*

No. 1 removes the tangent scale from the gun, and sets it by bringing the top of the movable socket to the required division on the yard or degree scale and clamping it. (Any odd number of minutes is given on the slow-motion screw at the head of the scale.) If any deflection is wanted, he sets the arrow on the sliding leaf to the required division and clamps it.

No. 1 having set his scale replaces it in the gun, taking care that the socket is home.

He then lays with a full sight, *i.e.*, he brings the top of the notch, the apex of the foresight and the point aimed at in line.

To ensure good laying the following rules must be observed:—

The eye not to be less than one foot in rear of the tangent scale notch, if possible more, and the distance between eye and notch not to be varied from round to round.

The head to be upright and the body in an easy position, supported if possible by holding on to or resting on the cascable.

The most conspicuous point in the object to be chosen to lay at.

The operation of laying to be completed as rapidly as possible so as not to fatigue the eye.

The gun to be laid a little above the object and then depressed on to it. This ensures the teeth of the elevating arc being in bearing with the driving pinion.

If the elevating gear is unserviceable and the gun has to be elevated by handspikes, the elevation should first be roughly obtained, 2 and 3 applying their handspikes under the breech and 4 attending to the coin, the gun being laid a little above the mark.

It is then traversed into line and the final adjustment for elevation obtained by 2 tapping the small coin with his handspike.

B.—When the object is visible from the battery, but the line of sight obscured by the parapet.

(5859)

2. Laying by plumb line.

If No. 1 can see the object from some spot immediately in rear of the gun (by standing on an empty shell box, &c.), he can obtain the direction by plumb line.

He sets the tangent scale to the elevation ordered, so that "drift" may be allowed for, and puts the deflection ordered on the deflection leaf. Then standing in rear of the gun he holds the plumb line so that it cuts both the sights. If the object is on the right of his line he gives "Trail left" and *vice versa*. When the plumb line cuts both the sights and the object, the direction has been obtained.

The elevation is given by clinometer applied on the surface cut on the gun.

Note.—The quadrant angle is the same as the angle of elevation when the object fired at is in the same horizontal plane as the gun or howitzer. If the object is below this horizontal plane, the quadrant angle is less; if it is above, the quadrant angle is greater than the angle of elevation. If therefore there is a great difference of level between the firing point and the object, the angle which a straight line joining the object and firing point made with the horizon (the angle of sight) must be ascertained, and added to or deducted from the angle of elevation (as given in the range tables), in order to obtain the quadrant angle, *i.e.*, the number of degrees and minutes at which the clinometer should be set.

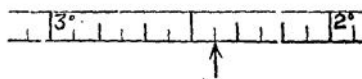
For information and instruction on the following, the Siege Artillery Drill Book, 1895, must be consulted:—

French's sights, auxiliary marks, methods of obtaining line of fire, night firing, see Section VIII. Observation of fire, see Section IX.

INSTRUCTIONS FOR USING WATKIN'S CLINOMETER.

To read the angles marked on the drum.—The brass drum is marked in degrees, commencing at 0° on the top to 45° at the bottom. Each degree is subdivided into twelve parts; each small division therefore represents angles of 5 minutes.

The scale is read from right to left, thus—



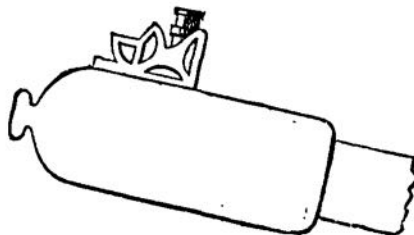
the reading opposite the arrow would indicate an angle of $2^\circ 25'$.

To lay a gun or howitzer at any angle up to 45° .—Unscrew the drum until the \uparrow points to the elevation required, place the clinometer, thus—

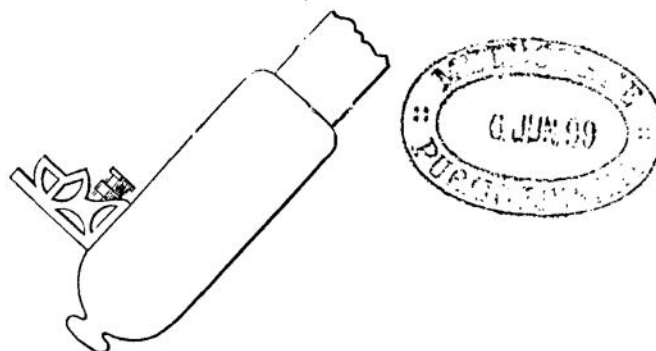


or the plane surface cut on the breech, and elevate the piece until the bubble of the spirit-level is in the centre of the tube.

For angles of depression.—Proceed as above, but reverse the direction of the instrument, placing it thus on the breech of the gun—



For angles of elevation greater than 45°.—Subtract the angle of elevation required from 90°, unscrew the drum to this reading; thus, for 60°, unscrew the drum to 30°, and place the instrument on the breech of the gun thus, and elevate until the bubble is in the centre of its run.



THE HASTY DISABLEMENT OF SIEGE GUNS AND FIELD GUNS.

1. The hasty disablement of siege guns will be carried out by the Royal Artillery, and of field guns by the Royal Horse Artillery.

STORES REQUIRED.

2. The necessary supplies of guncotton for the disablement of siege guns will be obtained from the Royal Engineer Siege Park.

3. The following stores will be carried with each unit of the Siege Train.

Boxes	..	{	guncotton slabs*	{ 1— $\frac{1}{2}$ slab	..	..	8
				{ 8— $\frac{1}{2}$ slabs	..	..	1
Cases	..	{	stores, disabling, ordnance, siege	..	..	..	1
			vesuvian matches	..	..	..	1
			detonator, for 8†..	..	..	..	2
			guncotton primers†	..	..	..	2
			guncotton slabs†	..	..	..	4

* Copper, tinned.

† Leather.

Cylinders	.. {	detonator, No. 8 for 8	2
		guncotton, primer, dry, $1\frac{1}{4}$ in. \times $1\frac{1}{4}$ in. for 8 ..	2
		Detonators, No. 8	16
Guncotton	.. {	dry primers, 1 perforation, $1\frac{1}{4}$ \times in. $1\frac{1}{4}$ in. ..	16
		wet slabs, 2 perforations, $6\frac{1}{8}$ in. \times $6\frac{1}{8}$ in. \times $1\frac{3}{8}$ in. ..	18
		Pouches, match-box†	1
		Rectifiers, guncotton primers	2
		Twine choking, 3-thread	pieces 1

4. These stores will only be issued in time of war. The guncotton and detonators will be carried by the Ammunition Reserve Column till active operations are impending; and when required in the field, the supply of guncotton (both slabs and primers) will be replenished from the Royal Engineer Field Park.

Instructions for Carrying out the Operations. §

5. In the case of guns of 64-pr. and larger calibres, two slabs must be employed.

6. Insert a detonator into a dry primer.

7. *On no account should a detonator be twisted or roughly forced into a primer.*

8. Insert the dry primer fitted with detonator in the perforation in one of the slabs, pushing it gently in until the hole in the slab is quite filled by it.

9. Tie a piece of twine round the detonator, pass the ends round the slab, and then tie them together; the object being to prevent the primer slipping out of the slab.

10. Place the slabs lengthways on the chase, their long sides touching, about a foot from the muzzle. Tie them on tightly with twine, to prevent them slipping from wind or other disturbing cause.

11. The exact position must depend on the form of the gun. The great thing is to have as much of the surface of the cotton in *actual contact* with the gun as possible. Hence the slabs should not ride on an astragal or moulding, but should always be placed on a plain part of the chase.

12. Observe the direction of the wind, and arrange the slab containing the detonator so that the tail of the safety fuze is away from the slab and to leeward of it. This is to lessen the chance of a spark igniting the guncotton before the detonator is fired, in which case in all probability, no effect whatever would be produced on the gun.

13. If projectiles belonging to the gun are available, and time allows, it is advisable to ram one up the bore; so that when the gun is dented by the explosion it may be imprisoned there and prevent the gun from being used even to fire a bag of bullets.

14. Tear or cut the little calico cap off the end of the safety fuze and ignite the fuze by the vesuvian matches provided, or other convenient means. An ordinary flame does not readily ignite it. The fuze ignites most easily when cut obliquely with a sharp knife.

15. Retire under cover, and await the explosion. The length of safety fuze will burn about 45 seconds.

16. Should circumstances permit, the effect of the detonation will be increased by placing a filled sandbag or a sod of turf on the gun-

* Copper, tinned.

† In half slabs, 1 perforation in each.

‡ Leather.

§ See note at end.

cotton, when lashed in position on the chase. Great care should be taken in this operation not to strike or bend the detonator.

17. It is also advisable, after the explosion, to try if the gun is so dented as to prevent loading. If the dent is not sufficient, the operation should be repeated, putting the fresh slabs in the same place as the first.

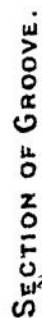
Caution.

18. Never roughly bend or kink the safety faze. If it has apparently gone out without firing the detonator, allow at least half an hour to elapse before meddling with it, if time will admit, but if not, the greatest care must be taken in touching it, to avoid accident by a "hang-fire."

19. The above instructions apply equally to the hasty disablement of field guns, but with them only one slab of guncotton need be used.

NOTE.—The above instructions have been prepared with special reference to the disablement or destruction of muzzle-loading guns. Breech-loading guns can generally be temporarily disabled by the removal or destruction of portions of the breech apparatus. In destroying such guns, or rendering them permanently disabled, Officers will, while being guided generally by these instructions, use their discretion as to the application of the charges in such positions as may appear most suitable, according to the particular construction of the gun to be operated upon.

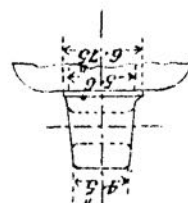
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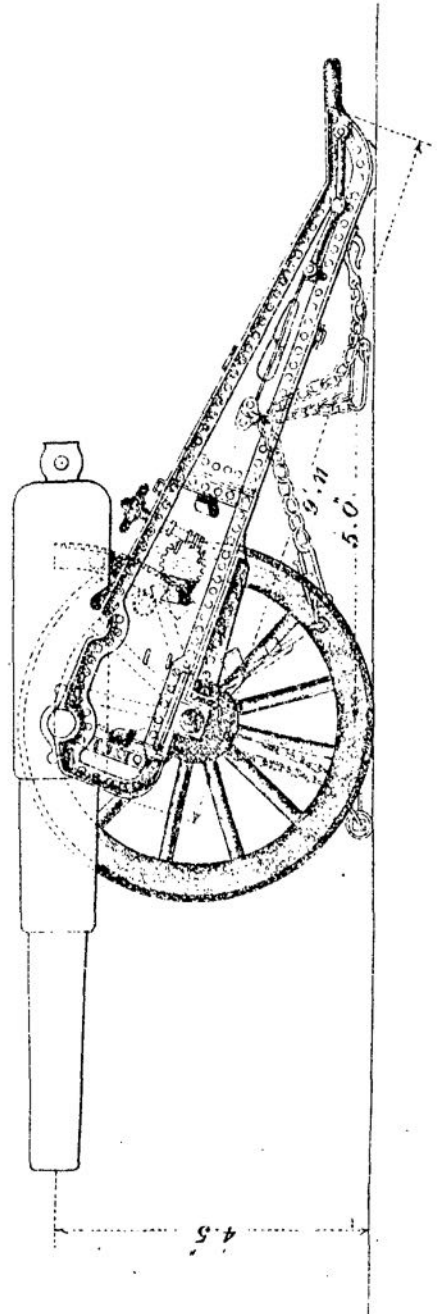
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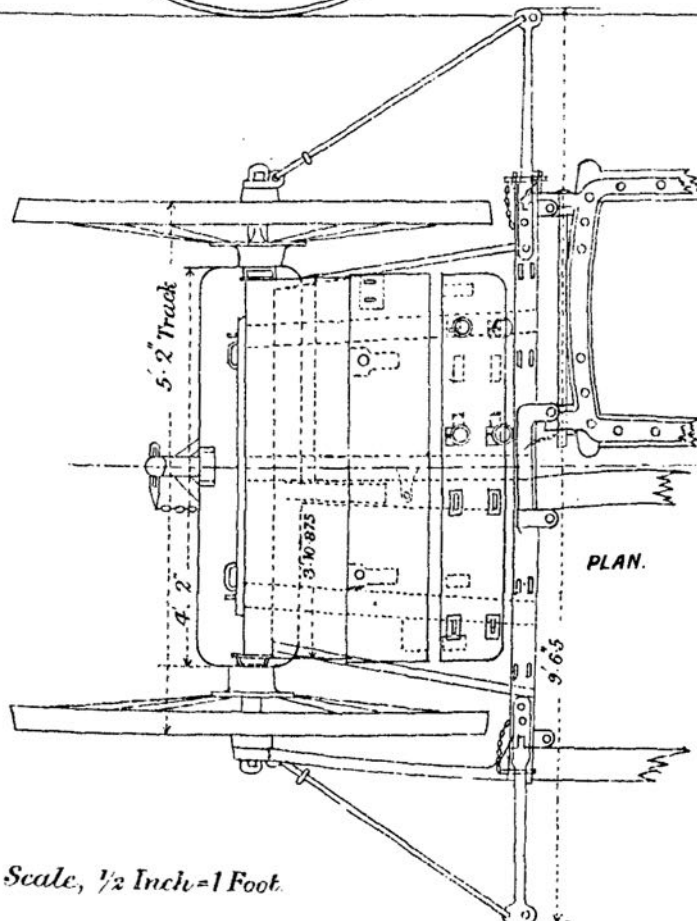
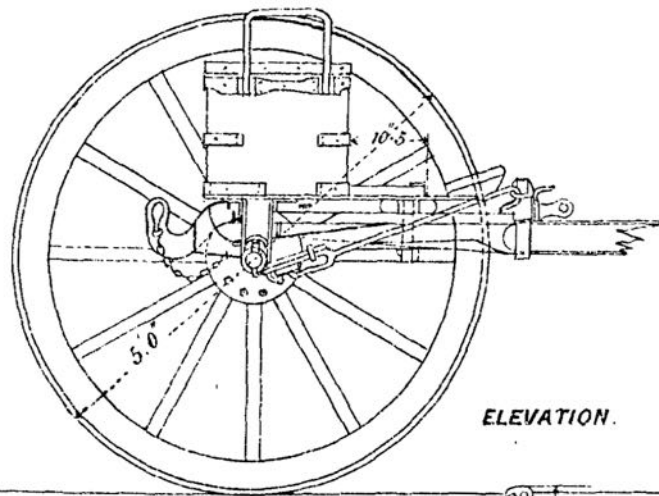
*Number of Grooves 3
Twisting an uniform Right
handed twist of 1 turn in
35 Calibres.*



CARRIAGE SIEGE R.M.L. 40 P.R. MARK II.

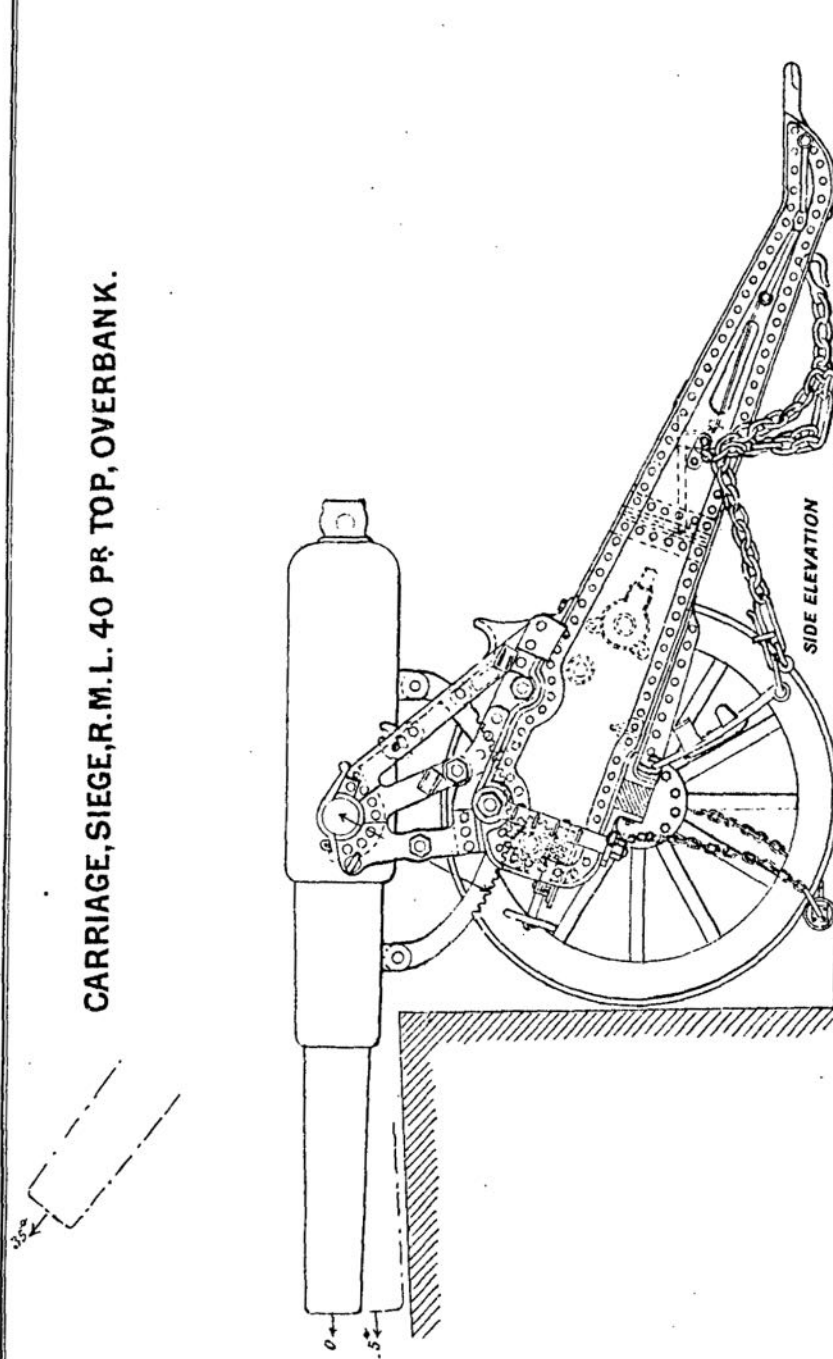


LIMBER, SIEGE, R.M.L. 40 PR GUN.
MARK II.

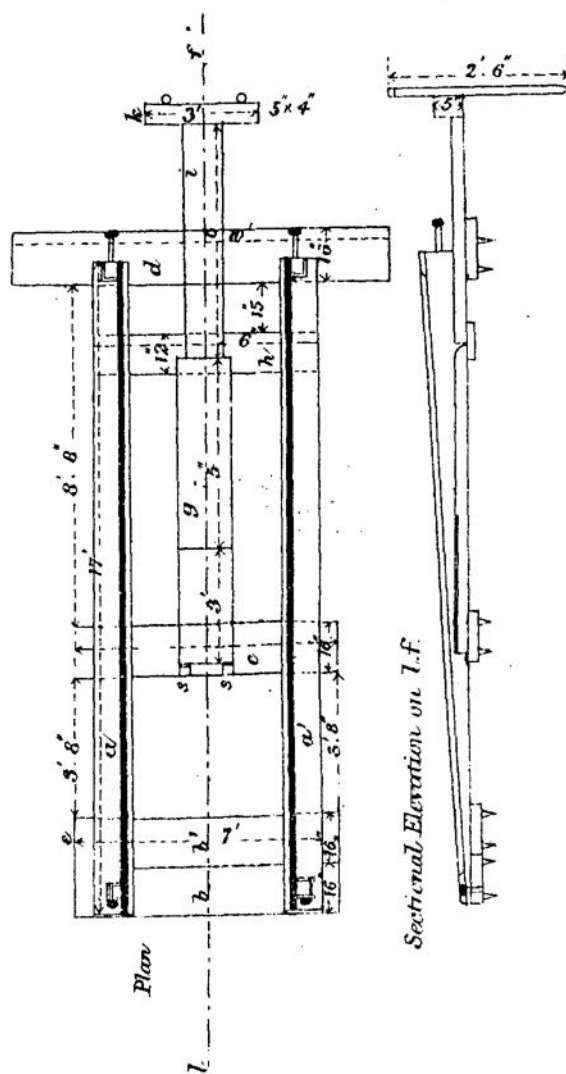


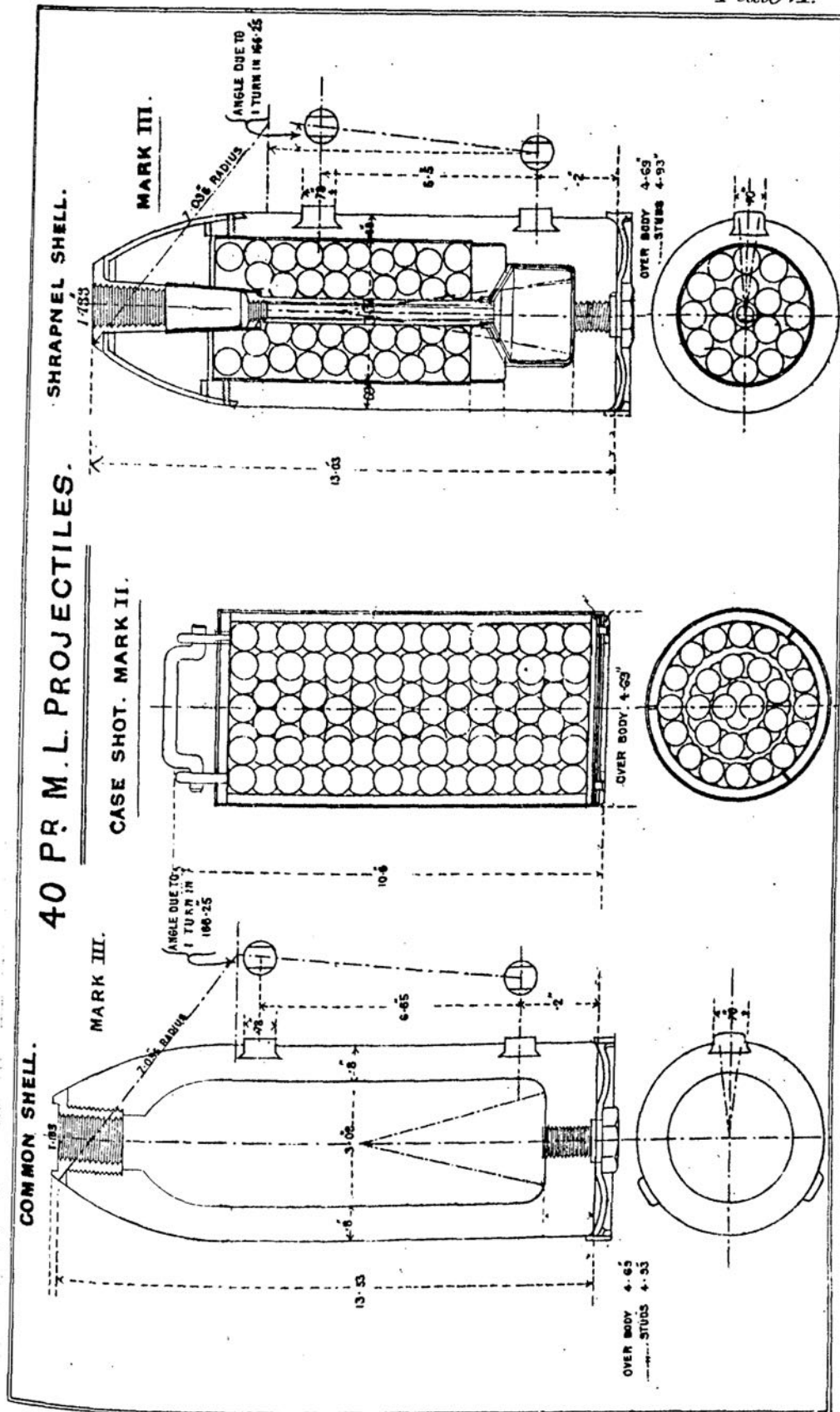
Scale, $\frac{1}{2}$ Inch = 1 Foot.

CARRIAGE, SIEGE, R.M.L. 40 PR TOP, OVERBANK.



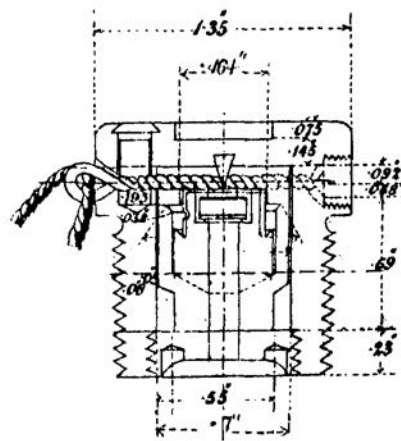
PLATFORM, SIEGE, CLERKS.
METHOD OF LAYING,



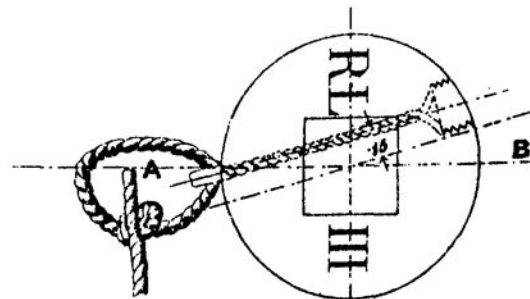


FUZE PERCUSSION R. L. N° 7. MARK III.

Full Size.



SECTION AT A. B.

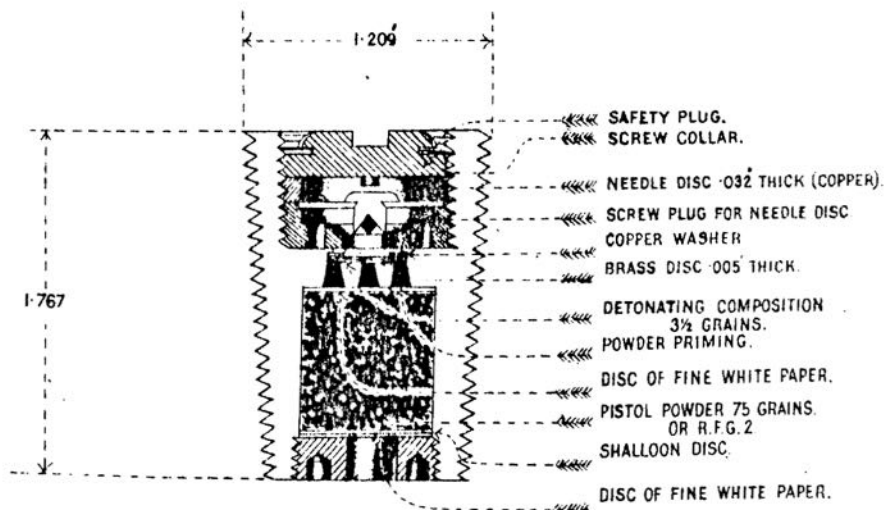


PLAN.

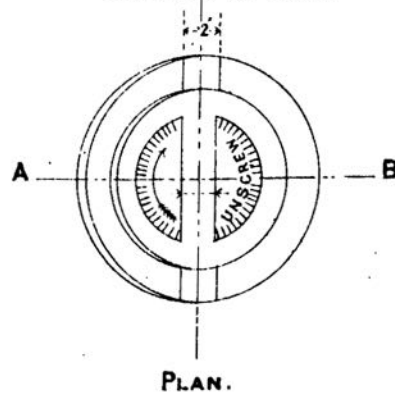
FUZE, PERCUSSION, DIRECT ACTION, N° 3. MARK III.

METAL 5 IN A TIN CYLINDER.

FULL SIZE.

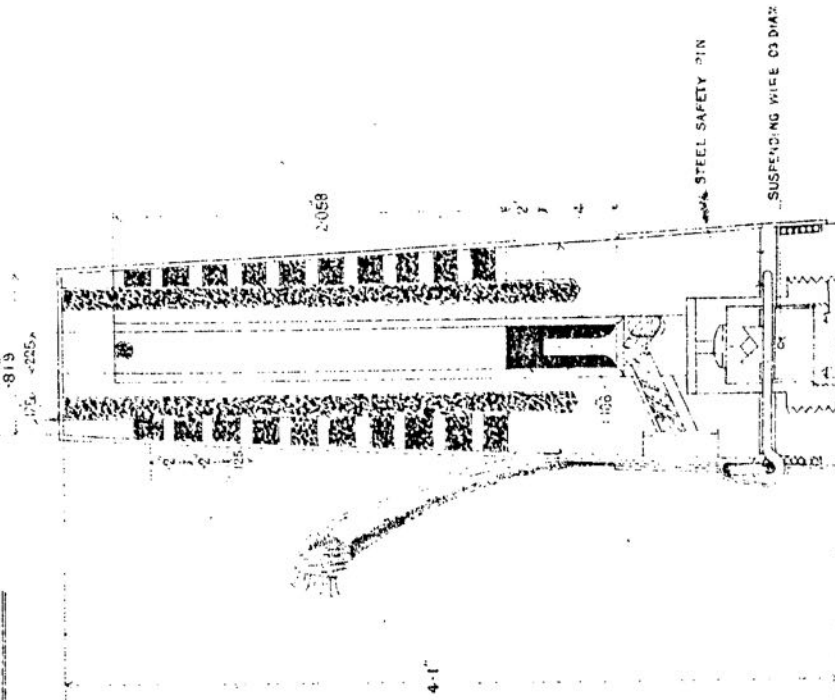
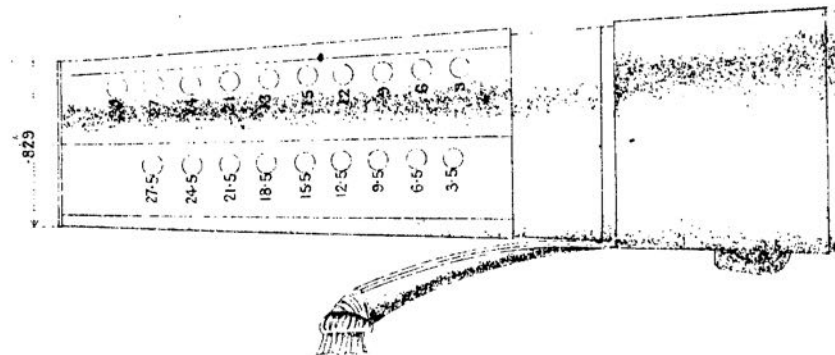


SECTION AT A.B.



FUZE, TIME 15 SECONDS, WITH DETONATOR. NO. 43. MARK III.
WOOD, 5 IN A TIN CYLINDER.

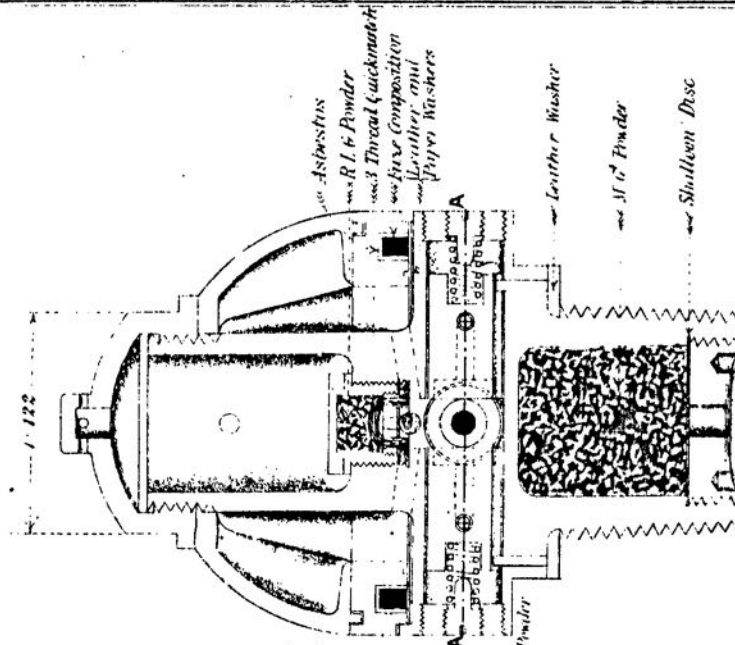
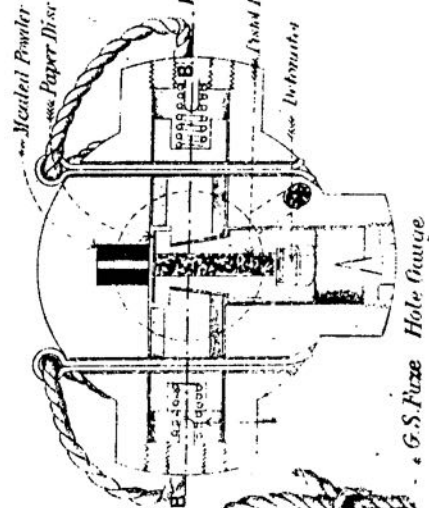
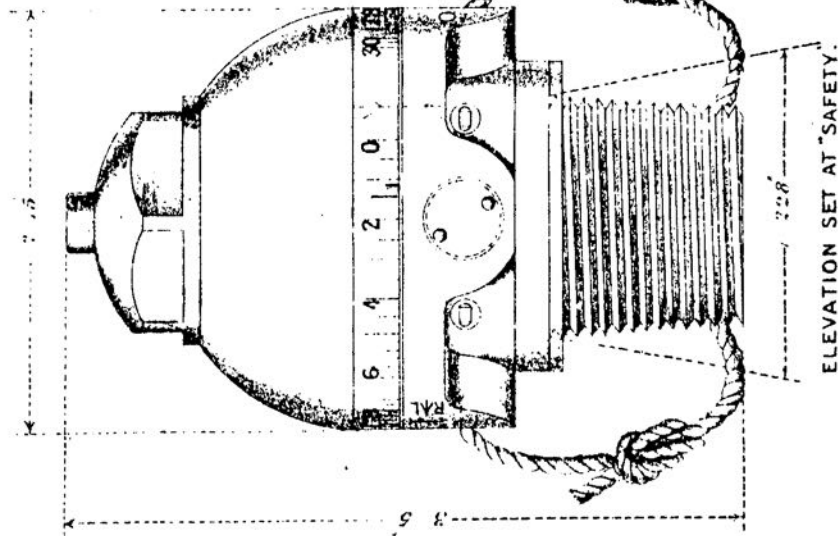
FULL SIZE.



STEEL SAFETY PIN

SUSPENDING WIRE 03 DIA

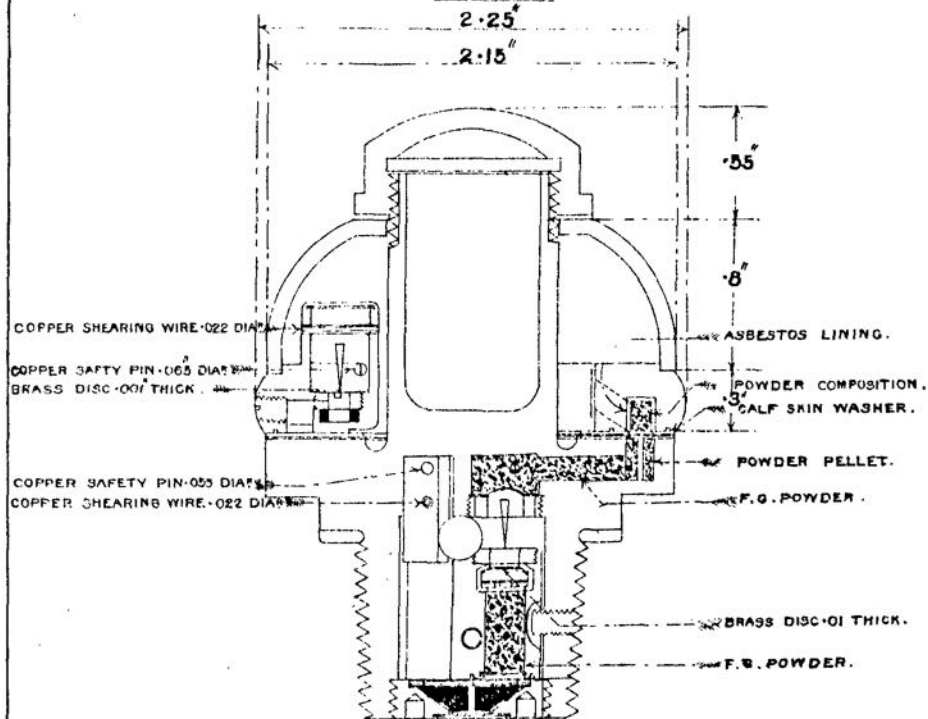
FUZE, TIME, SENSITIVE, MIDDLE, N° 24., MARK I.



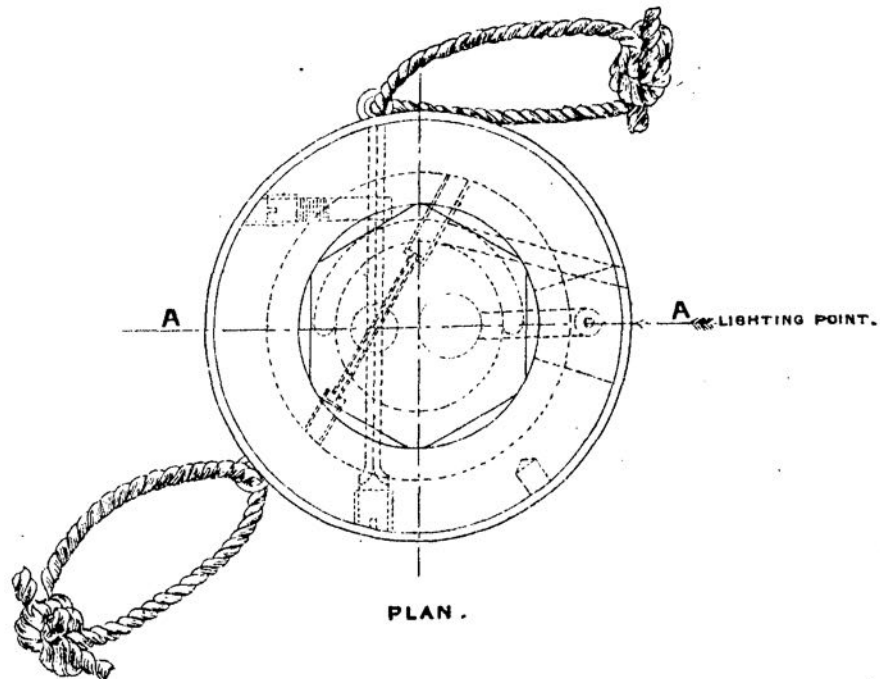
FUZE, TIME AND PERCUSSION, MIDDLE, N° 54, MARK II

METAL; I IN A TIN CYLINDER.

Full Size.



SECTION AT A.A.



40-PR. K.M.L. EQUIPMENT.
SIEGE.

LIMBER.

ON FOOTBOARD.

- 1 Lifting jack (Clerk's).
- 1 Pair drag ropes, heavy.

"NEAR" BOX.

- 1 Half-round tin grease box, 3 lb. (under).

"CENTRE" BOX.

- 1 Washer, drag, 1st class.
- 1 Washer, loop, 2nd class.

"OFF" BOX.

- 1 Drill hook (under).

1 Stick, portfire.	
3 Shrapnel shells.	1 Vent server.
6 Filled cartridges, in cartouch.	2 Common shells.
20 Ties, lynch pin.	1 Case shot.
1 Oil can.	
16 Percussion fuzes, R.L., No. 7.	
Wood time fuzes, 15 sec., No. 43.	
25 Friction tubes.	
3 Lanyards.	
Chalk.	
Line and reel.	
2 Linch pins.	
2 Trace couplers.	
2 Common spikes.	
1 Key, powder-case.	
6 Filled cartridges, in cartouch.	2 Common shells.
1 Vent server.	3 Shrapnel shells.

- 2 Cases, leather cartridge (under).
- 1 Swingletree (under).
- 1 Felling axe " "
- 1 Shovel (under).

- 1 Pickaxe (under).
- 1 Maul (under).

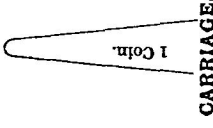
- 2 Leather buckets (under).
- 1 Spade (under).

ON INSIDE OF LID.

- Pricker, vent, 12 ins.
- Clinometer.
- Knife, clasp.
- Key plug, G.S.
- Clamp, tangent sight.
- Fore sight cross bar.
- Portfire clipper.
- Fuze extractor.

ON INSIDE OF LID.

- 2 Portfires.
- 1 Spring spike.
- 1 Fore sight.
- 1 Screw driver.
- 1 Spanner.
- 1 Hookbore.
- 1 Clamp, tangent sight.
- 1 Cylinder, with 6 bits.
- 1 Portfire clipper.
- 1 Tangent sight.
- 1 Pair scissors.



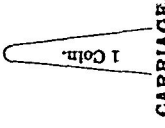
CARRIAGE.

ON INSIDE OF LID.

- 1 Pricker, vent, 12 ins.
- 1 Clinometer.
- 1 Knife, clasp.
- 1 Key plug, G.S.
- 1 Clamp, tangent sight.
- 1 Fore sight.
- 1 Tangent sight.
- 1 Portfire clipper.
- 1 Fuze extractor.

ON INSIDE OF LID.

- 2 Portfires.
- 1 Spring spike.
- 1 Fore sight.
- 1 Screw driver.
- 1 Spanner.
- 1 Hookbore.
- 1 Clamp, tangent sight.
- 1 Cylinder, with 6 bits.
- 1 Portfire clipper.
- 1 Tangent sight.



CARRIAGE.

LIMBER.

ON FOOTBOARD.

- 1 Lifting jack (Clerk's).
- 1 Pair drag ropes, heavy.

"NEAR" BOX.

- 1 Half-round tin grease box, 3 lb. (under).

"CENTRE" BOX.

- 1 Washer, drag, 1st class.
- 1 Washer, loop, 2nd class.

"OFF" BOX.

- 1 Drill hook (under).

1 Stick, portfire.	
3 Shrapnel shells.	1 Vent server.
6 Filled cartridges, in cartouch.	2 Common shells.
20 Ties, lynch pin.	1 Case shot.
1 Oil can.	
16 Percussion fuzes, R.L., No. 7.	
Wood time fuzes, 15 sec., No. 43.	
25 Friction tubes.	
3 Lanyards.	
Chalk.	
Line and reel.	
2 Linch pins.	
2 Common spikes.	
1 Key, powder-case.	
6 Filled cartridges, in cartouch.	2 Common shells.
1 Vent server.	3 Shrapnel shells.

- 2 Cases, leather cartridge (under).
- 1 Swingletree (under).
- 1 Felling axe " "
- 1 Shovel (under).

- 1 Pickaxe (under).
- 1 Maul (under).

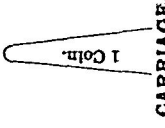
- 1 Leather bucket (under).
- 1 Spade (under).

ON INSIDE OF LID.

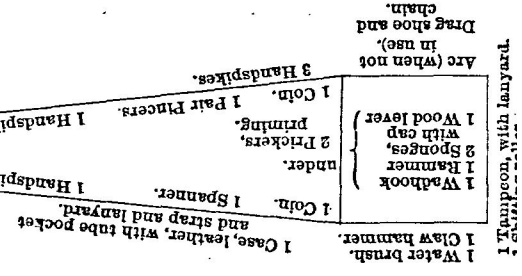
- 1 Pricker, vent, 12 ins.
- 1 Clinometer.
- 1 Knife, clasp.
- 1 Key plug, G.S.
- 1 Clamp, tangent sight.
- 1 Fore sight.
- 1 Tangent sight.
- 1 Portfire clipper.
- 1 Fuze extractor.

ON INSIDE OF LID.

- 2 Portfires.
- 1 Spring spike.
- 1 Fore sight.
- 1 Screw driver.
- 1 Spanner.
- 1 Hookbore.
- 1 Clamp, tangent sight.
- 1 Cylinder, with 6 bits.
- 1 Portfire clipper.
- 1 Tangent sight.



CARRIAGE.



CARRIAGE.